USB3-FRM14

User's Manual

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1. Introduction

SDI (Serial Digital Interface) is a family of video interfaces by SMPTE (Society Motion and Television Engineers). These standards are used for transmission of uncompressed, unencrypted digital video signals.

[Table 1. Standard SMPTE]

Standard	Name	Bitrates (Max)	Resolution(Max)	Transfer Length(Max)
SMPTE 259M	SD-SDI	360Mbit/s	480i[1], 576i	20dB : 364m 30dB : 545m
SMPTE 344M	ED-SDI	540Mbit/s	480p[2], 576p	
SMPTE 292M	HD-SDI	1.485Gbit/s	720p, 1080i	20dB : 179m 30dB : 268m
SMPTE 372M	Dual HD-SDI	2.970Gbit/s	1080p	
SMPTE 424M	3G-SDI	2.970Gbit/s	1080p	

caution) 1. i : Interlaced 2. p : Progressive

*** USB3-FRM14 is supported up to 1080p(30fps), but Interlace mode does not currently support.**

The various serial digital interface standards all use coaxial cables with BNC connecters, with a nominal impedance of 75 ohms. The data of image, sound and various digital information (Line Counter, CRC) can carry hundreds meter far using coaxial cable. Transfer is serial communication, but the final processed image data is processed the parallel RGB or YCbCr such as the [Table 2].

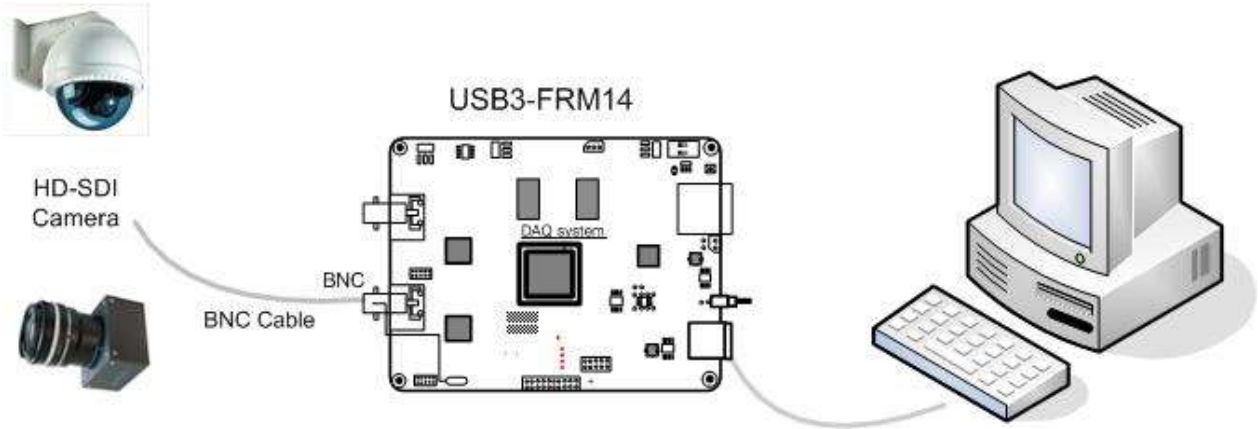
[Table 2. SDI Data Type]

Standard	Name	Frequency	Data Type	Data
SMPTE 259M	SD-SDI	270Mbps	YCbCr	4 : 2 : 2
SMPTE 292M	HD-SDI	1.5Gbps	YCbCr	4 : 2 : 2
SMPTE 372M	Dual HD-SDI	2 x 1.5Gbps	YCbCr RGB	4 : 2 : 2 4 : 4 : 4
SMPTE 424M	3G-SDI	3Gbps	YCbCr RGB	4 : 2 : 2 4 : 4 : 4

Caution) Some high-end 3G-SDI, it may have a truncated screen depending on your system specifications.

The USB3-FRM14 is a board having the function of processing the frame data received from HD-SDI (High Definition Serial Digital Interface) standard camera and transfer to PC through Super Speed (5Gbps) USB3.0 interface. It can support a Full HD (High Definition) resolution.

The operation of the board is controlled by program API, figure [1-1] shows connection of the system (usually PC).



[Figure 1-1. USB3-FRM14 board Usage]

As shown in Figure [1-1], the USB3-FRM14 is inserted into any available USB3.0 slot in your PC. It receives Image Frame through HD-SDI interface and saves the received data in the system main memory via Super Speed(5Gbps) USB3.0 interface.

[Features of the USB3-FRM14]

- 1.485Gbit/s HD-SDI (High Definition Serial Digital Interface)
- Supports SMPTE 259M(SD-SDI), SMPTE344M(ED-SDI), SMPTE292M(HD-SDI)
- Supports 8-bit, 10-bit component digital video
- RGB or YCbCr 4:4:4 / YCbCr 4:2:2 or 4:2:0
- Serial Digital Interface uses BNC Connecter/Cable(75Ohm Coaxial)
- Ancillary (ANC) Data Detection
- USB3.0 Interface (Super Speed 5Gbps)
- 256MByte Image Buffer Memory
- Supports 480p, 576p, 720p, 1080p formats
- Windows 2000 SP4 or Windows XP SP1 above
- Convenient Windows Application Programming Interface(DLL)

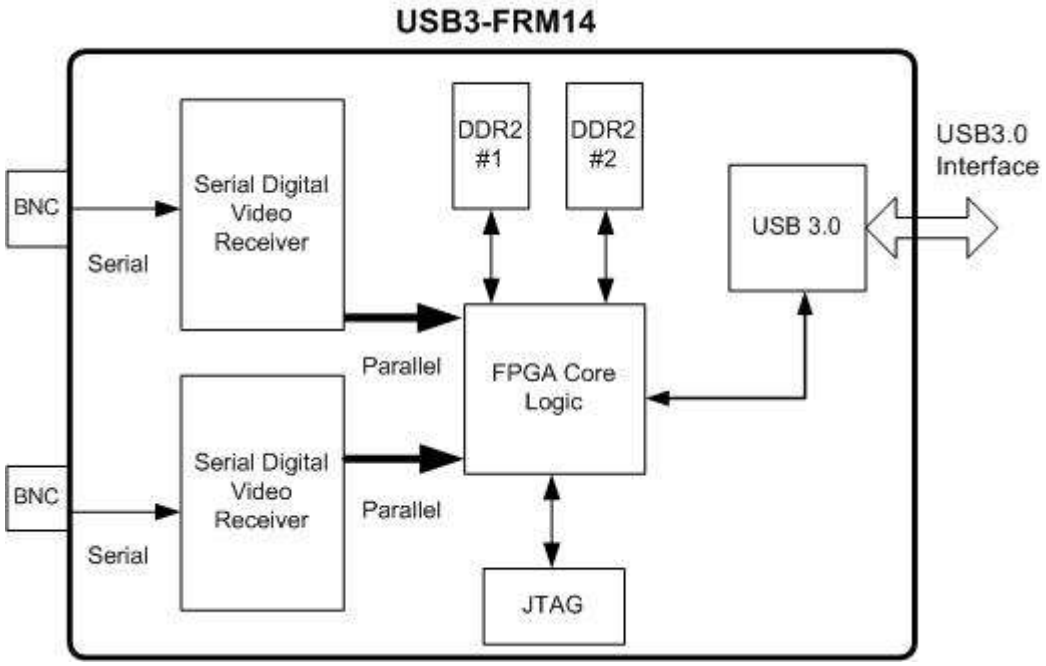
[Application]

- Interface for CCTV & DVR
- Image Acquisition (Pattern, Particle etc)
- Inspection Equipment (Sensor, Semiconductor, Device etc)
- Security Solution (CCTV Surveillance Cameras)
- Broad-casting

2. USB3-FRM14 Function

2.1 Block Diagram

As shown in the following figure, main control of the USB3-FRM14 board is performed in FPGA Core Logic. Primary functions are receiving the image frame data through two Mini MDR-26 connector, and saving the DDR#1, DDR#2 memory, and transmitting to PC upon request. You can control these functions using API through a USB 3.0 interface.

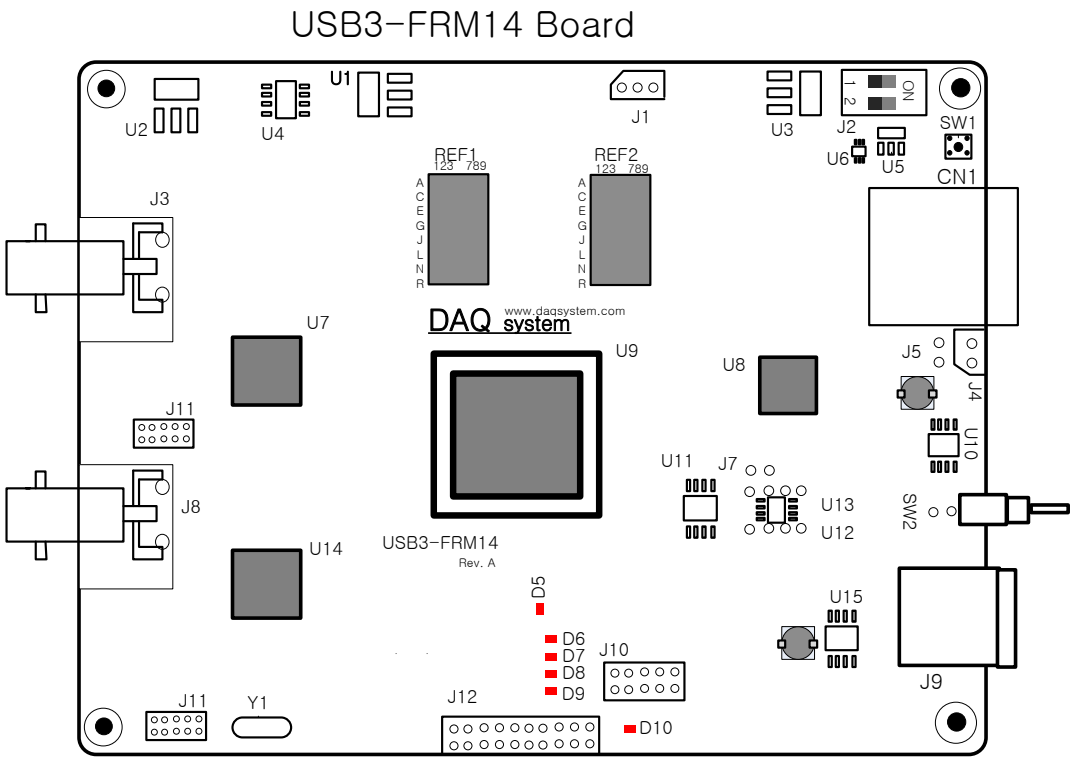


[Figure 2-1. USB3-FRM14 Functional Block Diagram]

The core logic program of the FPGA is loaded by JTAG. It saves a program at the FPGA Program Logic and loads when power-up.

2.2 USB3-FRM14 Layout

In this chapter, the primary functions of the USB3-FRM14 board are described briefly. For more information, refer to the device specification



[Figure 2-2. USB3-FRM14 PCB Layout]

There are 6 LED in the board, each explanation is as follows.

D5 : turns on when power is applied to the board and the initialization ends up.

D6 : turns on when the vertical counter signal detects.

D7 : turns on when vertical synchronization signal detects. (vsync)

D8 : turns on when the clock counter signal detects.

D9 : turns on when the horizontal synchronization signal detects. (hsync)

D10 : turns on when power(3.3V) is applied to the board..

2.3 Description of the functional blocks

(1) **BNC Connecter : J3, J8**

Caution) You should be used to connect the J8(Channel 0) connector at first.

(2) **SDI Receiver : U7, U14**

Receive the SDI Data.

(3) **FPGA : U9**

All of the board functions are controlled by the Logic program of the FPGA.

(4) **Regulator : U1, U2, U3**

This block is for supplying the power to the board.

(5) **USB 3.0 Interface Chipset : U6**

This block supports USB3.0 Super Speed interface.

(6) **DDR Memory : REF1, REF2**

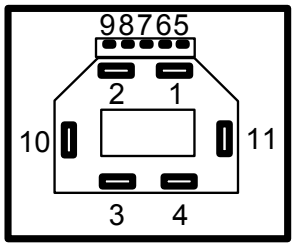
After save the data in a frame unit, transfer to PC through FPGA.

2.4 Connector Pin-out

The board has several connectors and jumpers to set. The USB3-FRM14 board is equipped with two main connecters, USB3 B-type connector for USB connection and BNC connecter J3 and J8.

2.4.1 CN1 Connecter

The USB3-FRM14 has a USB-B type connector for high speed USB connection.
[Figure 2-3] and [Table 3] shows the CN1 connector and its pin description.



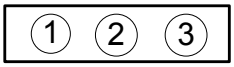
[Figure 2-3. CN1 Connector (USB3.0 standard powered-B type Front View)]

[Table 3. USB3.0 Standard Powered-B Connector]

Pin	Signal Name	Description	Remark
1	**VBus**	+5V Power	+5V Power
2	**USB D-**	USB2.0 data (Negative)	USB2.0 Signal
3	**USB D+**	USB2.0 data (Positive)	USB2.0 Signal
4	**GND**	Ground for Power Return	USB Power GND
5	**StdA_SSTX-**	Super Speed Transmitter (Negative)	USB3.0 Signal
6	**StdA_SSTX+**	Super Speed Transmitter (Positive)	USB3.0 Signal
7	**GND_DRAIN**	Ground for Signal Return	USB Power GND
8	**StdA_SSRX+**	Super Speed Receiver (Positive)	USB3.0 Signal
9	**StdA_SSRX-**	Super Speed Receiver (Negative)	USB3.0 Signal
10	**DPWR**	Power Provided by Device	USB Power GND
11	**DGND**	Ground return for DPWR	USB Power GND

2.4.2 J1 Connecter (3Pin Header, 2.54mm)

External RS-232 Debug Port.



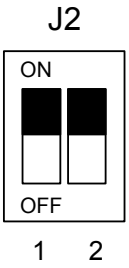
[Figure 2-4. J2 Connector (Top View)]

[Table 4. J2 PIN-OUT Description]

No.	Name	Description
1	**U_SPI_MISO**	Tx (Transceiver Data)
2	**U_SPI_MOSI**	Rx (Receiver Data)
3	**GND**	Ground

2.4.3 J2 Switch

USB3-FRM14 board is designed of four maximum USB3-FRM14 boards at the same time so as usable. Distribution of each board sets it up through 4 pin switch (J2) in a board.



[Figure 2-5. J2 Switchj]

[Table 5. J2 Description]

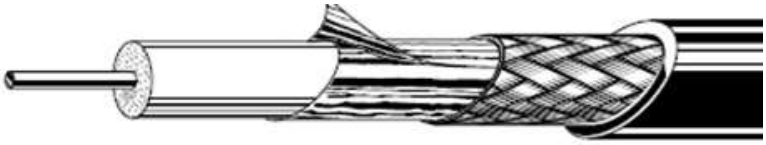
1	2	Description
OFF	OFF	Board No. 0
ON	OFF	Board No. 1
OFF	ON	Board No. 2
ON	ON	Board No. 3

2.4.4 J3, J8 BNC Connecter

BNC(Bayonet Neil-Concelman) connecter is a miniature quick connect/disconnect RF connecter used for coaxial cable. It features three part of cable, at the center of the signal lines and coax internal signal that surround outer conductor (shield), and insulation. BNC connecters are made to match the characteristic impedance of cable at either 50 ohms or 75 ohms. The 75 ohm types can sometimes be recognized by the reduced or absent dielectric in the mating ends.

[Figure 2-6. BNC Connecter and Cable]

Caution) Report : (RG-59 75Ohm Cable for BNC Connecter, Canare BCP-C4F)



[Figure 2-7. Cable Section]

2.4.5 J5 Jumper

It connects to jumper when using USB3 5V power. However, It does not connect when using external power(12V).

2.4.6 J9 Connecter

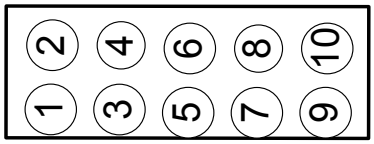
External 12V DC Jack Power Connector of DC-005(2.0) type.

The central part of the DC Jack is +12 V.

[Figure 2-8. Rated Output]

2.4.6 J10 Connecter

The J9 connector is used for the FPGA program upgrade. Never use it at the normal operation. [Figure 3-6] shows the J9 connector.



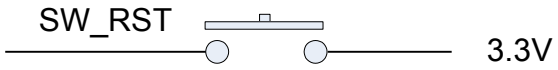
[Figure 2-9. J10 Connecter (Top View)]

[Table 6. J10 Connecter Description]

Bo.	Name	Description
1	**BTCK**	Clock
3	**BTMS**	Mode Select
5	**BTDI**	Data In
7	**BTDO**	Data Out
2,4,8	**GND**	GND
6	**3.3V**	+3.3V Power
9	**N.C**	No Connection
10	**PROG_B**	isPEN/Enable/Prog

2.4.7 SW1

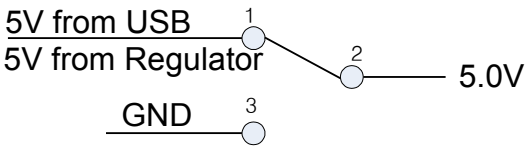
3.3V Power Reset Switch.



[Figure 2-10. SW1 Switch]

2.4.8 SW2

Board Power (5V from USB or Power Generator) On/Off Switch.
When the switch is Up state, power(5V) is On.



[Figure 2-11. SW2 Switch]

2.5 Ancillary Data

USB3-FRM14 board can show Vertical Ancillary Data (VANC).

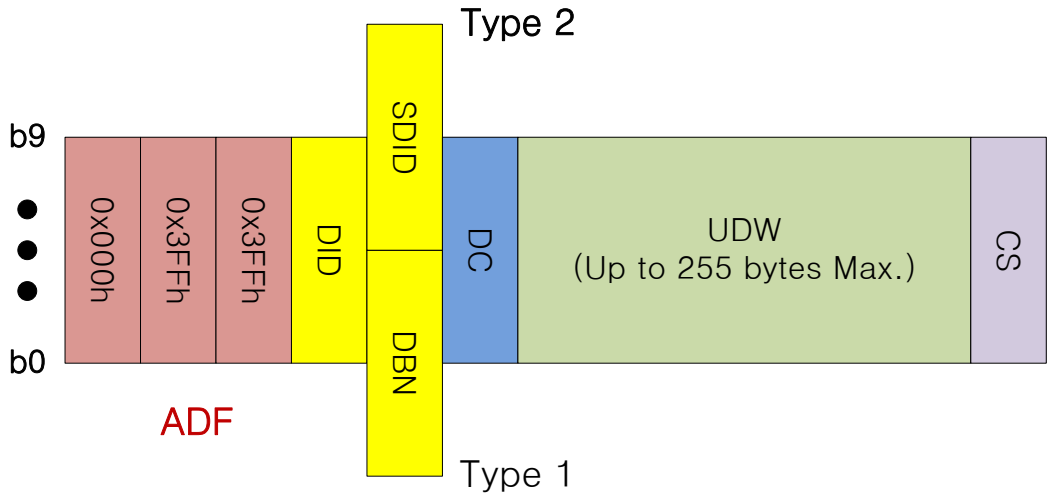
Ancillary Data(commonly abbreviated as ANC Data), in the context of television system, refers to a means which by non-video information(such as audio, other forms of essence, and metadata). It may be embedded within the SDI(Serial Digital Interface), is standardized by SMPTE291M(Ancillary Data Packet and Space Formatting).

ANC data are divided into two types as [Figure 2-10], depending on where they are located. Ancillary packets located in the horizontal blanking area, are known as **Horizontal Ancillary Data** or **HANC**, HANC is commonly used for higher-bandwidth, mainly is embedded audio. In case of HD can be embedded 16 channels audio. Ancillary packets located in the vertical blanking area, are known as **Vertical Ancillary Data** or **VANC.** VANC is commonly used for lower-bandwidth. Closed caption data and VPID(Video payload identifier) are generally stored as VANC.

[Figure 2-11. HANC and VANC Area]

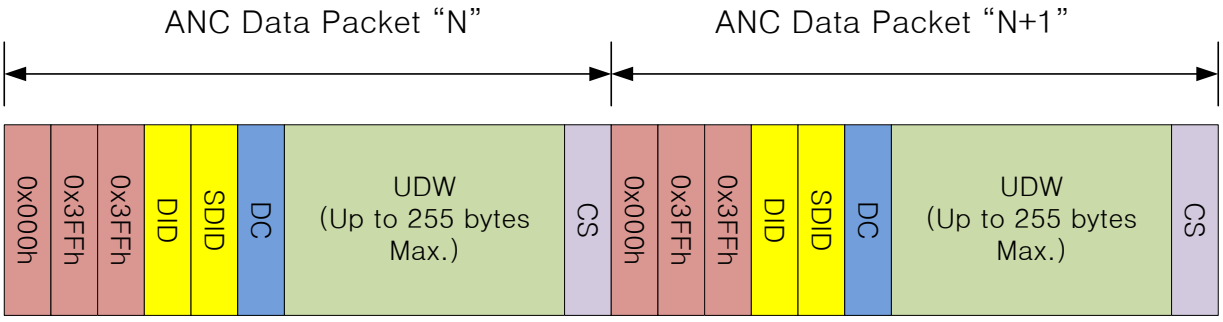
All ANC packets must start with a specific start sequence, for component interfaces(the only kind of Srial Digital Interface is widespread use today), the start sequence is 0x00 0x3FF 0x3FF. This sequence is otherwise illegal in the serial digital interface. These words follow the start sequence in the header. The first word after the start sequence is the **DID**(Data Identifier), followed by either a **SDID**(Secondary Data Indetifier or a **DBN**(Data Block Number), followed by a **DC**(Data Counter). After the DC word are 0 ~ 255 **UDW**(User Data Words), followed by a **CS**(Check Sum).

Depending on the configuration of the ANC Packet is divided into Type1 and Type2.

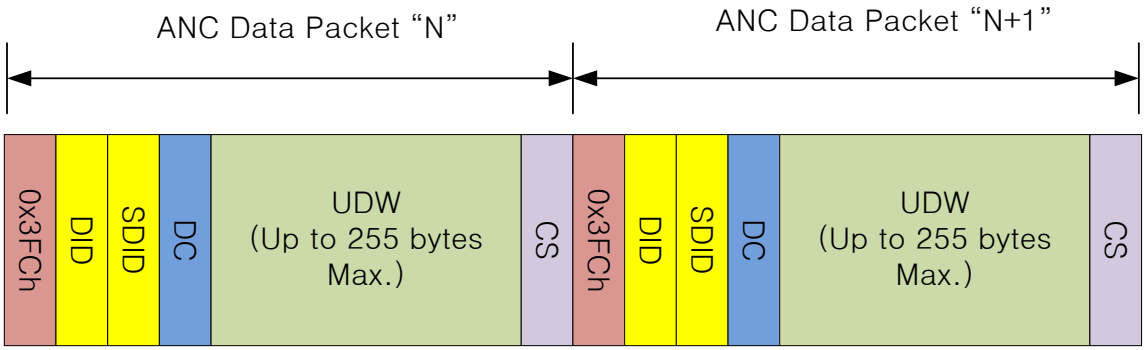


[Figure 2-12. ANC Packet Structure]

(1) **ADF** --- Ancillary Data Flag always start sequence is 0x000, 0x3FF, 0x3FF (b9..b0 : in case of 10-bit) or 0x00, 0xFF, 0xFF(b7..b0 : in case of 8-bit). In the obsolete composite versions of SDI, the Ancillary Data start sequence is a single word, 0x3FCh.



[Figure 2-13. Component Ancillary Data Packet Structure]



[Figure 2-14. Composite Ancillary Data Packet Structure]

(2) **DID** --- Data Identification word indicates the type of ancillary data that the packet corresponds to. Data identifiers range from 0 to 255, with 0 being reserved.

A Serial Data Interface is a 10-but format, the DID word is enclosed as follows:

Bit 0 ~ 7 : raw DID value

Bit 8 : even parity from bit 0 to bit7

Bit 9 : Not Bit8

Thus, a DID of 0x61(011000001) would be enclosed as 0x161(01011000001), where as a DID of 0x63(01100011) would be encoded as 0x263(1001100011).

If the DID is equal to 128(0x80)or greater, then the packet is a Type 1. And the DID is less than to 128, it is a Type 2 Packet.

(2) **SDID** --- Secondary Data Identification word for Type 2

[Table 7. Data Identification Word Assignment]

Data Type	Data Value	Data Assignment
Type 2 (2-Word ID)	00h	Undefined Format
	01h ~ 03h	Reserved
	04h ~ 0Fh	Reserved
	10h ~ 3Fh	Reserved
	40h ~ 4Fh	Internationally Registered
	50h ~ 5Fh	User Application
	60h ~ 7Fh	Internationally Registered
Type 2 (1-Word ID)	80h	Ancillary Packet marked for deletion
	81h ~ 83h	Reserved
	84h	Optional Ancillary Packet Data end marker
	85h ~ 87h	Reserved
	88h	Optional Ancillary Packet Data start marker
	89h ~ 9Fh	Reserved
	A0h~ BFh	Internationally Registered
	C0h~ CFh	User Application
	D0h~ DFh	Internationally Registered
	E0h~ FFh	Internationally Registered

Data Type	Data Value	Data Assignment
Type 2	00h	Undefined Format
	01h	None

The SDID is only if the DID is less than 128(80 hex), is normally an 8-bit value. It is encoded in the same fashion as the DID.

Bit 0 ~ 7 : b7 (MSB) through b0 (LSB) identification bit word (00h ~ FFh)

Bit 8 : even parity from Bit 0 to Bit7, Bit 9 : Not Bit8

(4) **DBN** --- The Data Block Number is only valid if the DID is 127(80 hex) or greater. It is used to identify multiple packets of the same type within a field. The DBN is an 8-bit value, encoded in the same fashion as the SDID.

(5) **DC** --- Data Counter number word indicates how many user data words (UDW) to follow. The DC is an 8-bit value, encoded in the same fashion as the DID.

(6) **UDW** --- User Defined Words are the "payload" present in the ANC packet, up to 255 bytes of user data is stored.

[Table 8. SMPTE 352M UDW Sample]

Bits	Byte 1	Byte2	Byte3	Byte4
Bit7	0x84 : HD720 **0x85 : 1080 (SMPTE352M)**	0 : Interlaced or 1: Progressive Transport	Reserved	Reserved
Bit6	0x89 : 3G-A 0x8A : Level B (SMPTE372)	0 : Interlaced or 1: Progressive Picture	Horizontal Y'/Y Sampling 0 : 1920, 1 : 2048	Reserved
Bit5	0x8B : Level B (2x7x20)	Reserved	Reserved	Reserved
Bit4	0x8C : Level B (2x1080)	Reserved	Reserved	Dynamic Range 0 : 100% 1 : 200% 2 : 400% 3 : Reserved
Bit3		Frame Rate 0 : No defined Value 1 : Reserved, 2: 24/1.001, 3 : 24, 4 : 49/1.001, 5 : 25, 6 : 30/1.001, 7 : 30, 8: 48. 9 : 50, A : 60/1.001, B : 60, C, D ,E, F : Reserved	Sampling Structure 0 : 4:2:2(Y/Cb/Cr), 1 : 4:4:4, 3 : 4:2:0, 4 : 4:2:2:4(Y/Cb/Cr/A), 5 : 4:4:4:4(Y/Cb/Cr/A), 6 : 4:4:4:4(G/B/R/A), 8 : 4:2:2:4(Y/Cb/Cr/D), 9 : 4:4:4:4(Y/Cb/Cr/D), A : 4:4:4:4(G/B/R/D), 7, B, C, D, E, F : Reserved	
Bit2				
Bit1				Reserved
Bit0				Bit Depth 0 : 8-bit, 1: 10-bit 2 : 12-bit, 3: Reserved

(7) **CS** --- The last word is an ANC packet is the Checksum. It is computed by computing the sum(modulo 512) of bits 0 ~ 8, of all the other words in the ANC packet, excluding the packet start sequence.

3. Installation

After unpacking, inspect the board to make sure there are no damages on the package.

3.1 Package Contents

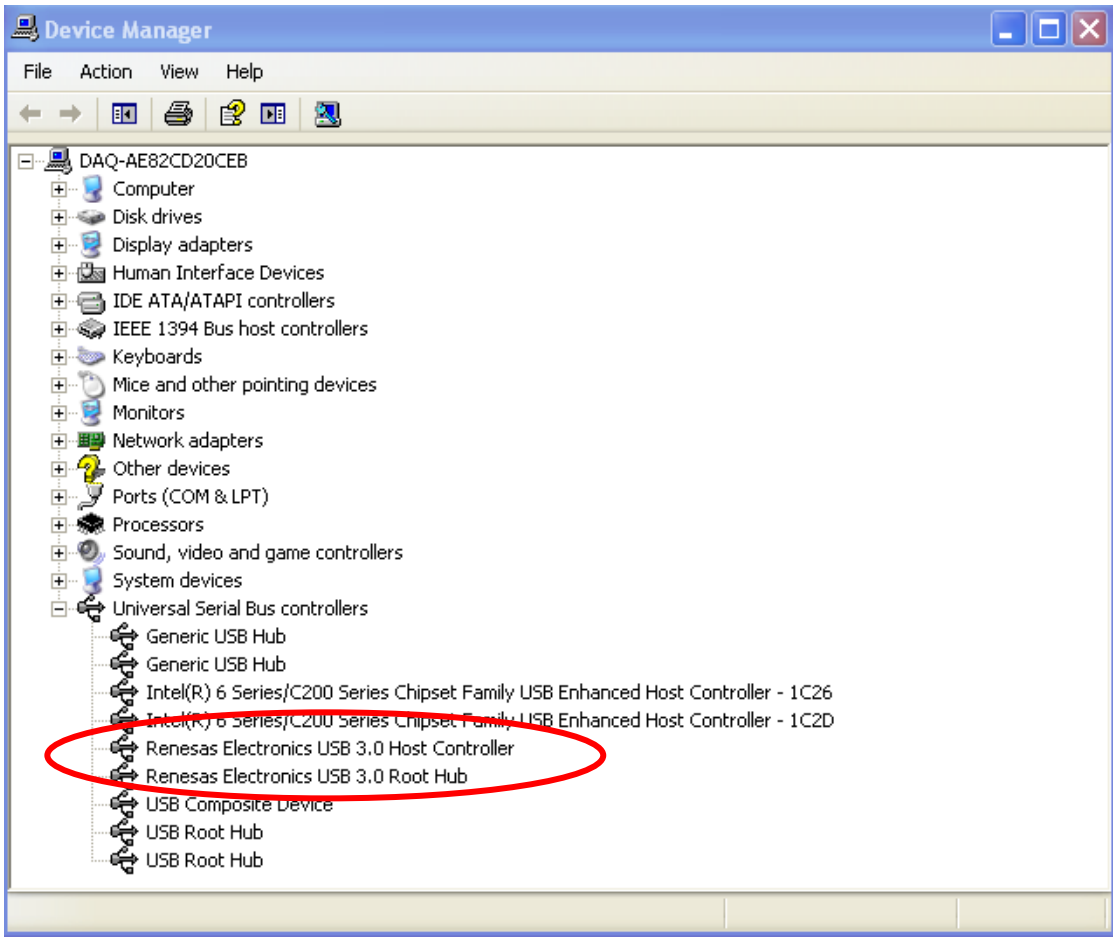
Product Contents

1. USB3-FRM14 Board
2. USB3(A-B) Cable
3. CD (Driver/Manual/API/Samples etc.)

3.2 Installation Sequence

To install USB3-FRM14 board in your environment, do the following steps. The USB3-FRM14 board is completely Hot-Plug and Plug & Play. Therefore, you can install it easily.

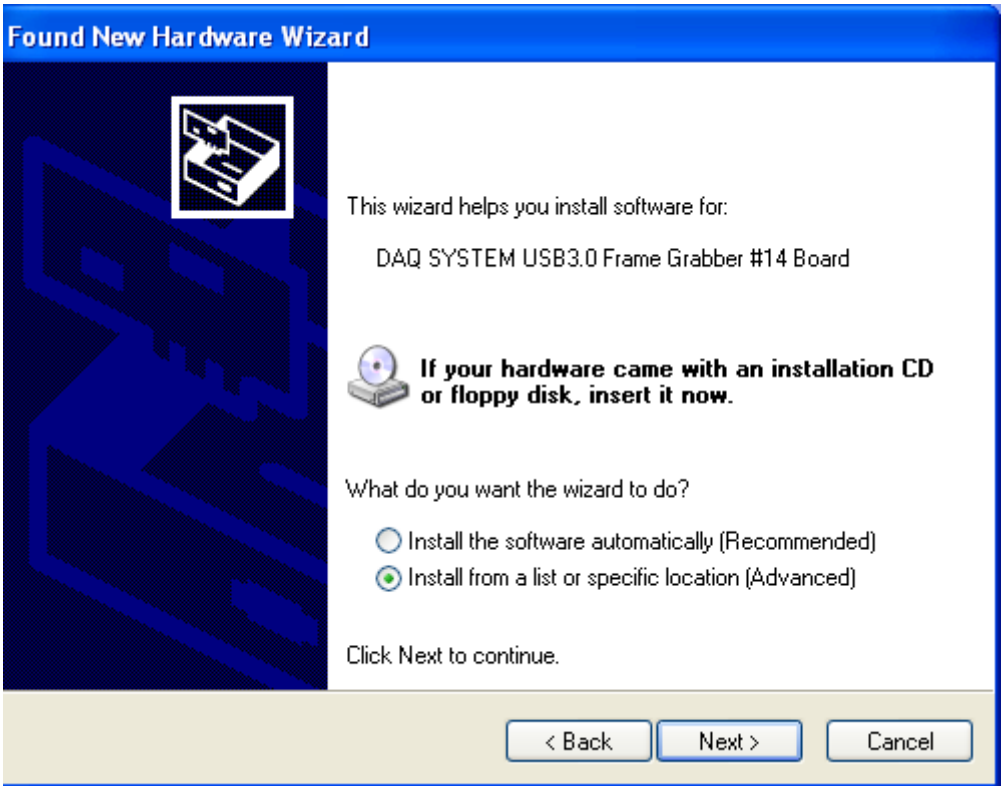
The required PC operating system for the USB3-FRM14 is Windows XP SP1 higher or Windows 7. The USB3-FRM14 uses USB Super Speed interface thus "xxx **USB 3.0 Root Hub**" should be installed in your PC. You can check this condition by doing the following steps.



[Figure 3-1. "Device Manager" window]

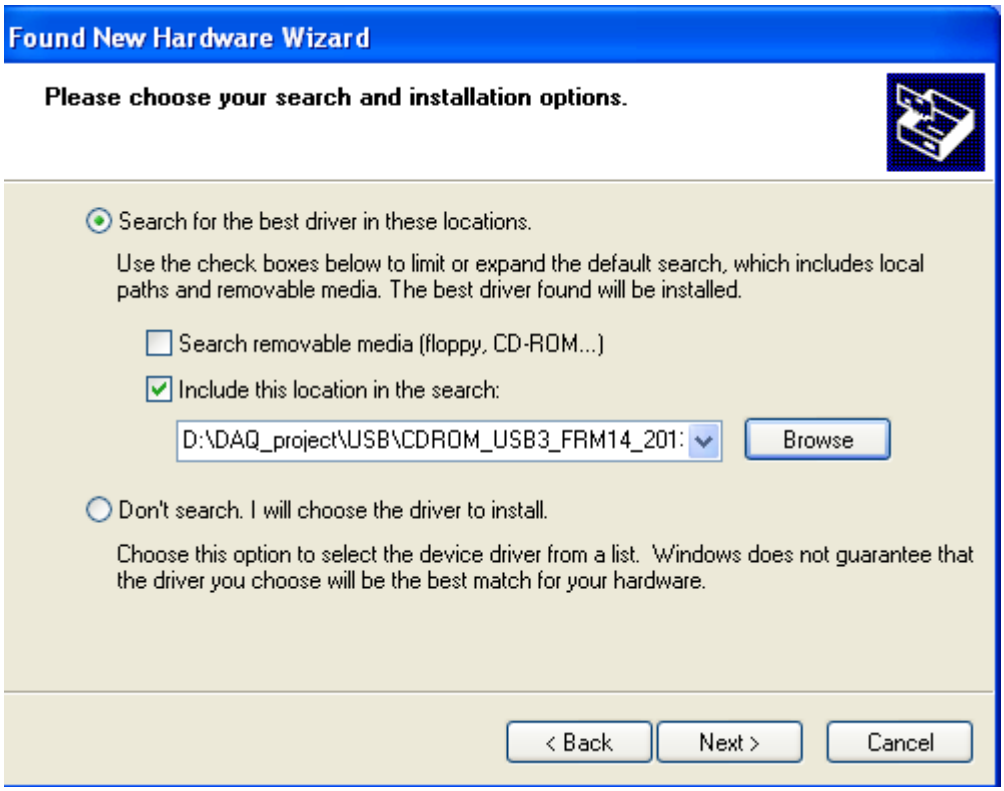
The item “USB 3.0 Root Hub” should be shown in the “Device Manager” window as shown in [Figure 4-1]. After checking the PC environmental conditions for USB3-FRM14, do the following steps to install the board

(1) Install the USB3-FRM14 board into your system.
(2) Power on the frame grabber.
(3) Confirm the LED(D4) on the USB3-FRM14 board turns on.
(4) Connect USB3 A-B cable between the case and your PC.
The Add New Hardware Wizard will appear in order to install the driver for new hardware.
(5) The Add new Hardware Wizard will install the driver in the following process. The following install process is explained based on Windows XP operating system.


Found New Hardware Wizard
This wizard helps you install software for:
DAQ SYSTEM USB3.0 Frame Grabber #14 Board
If your hardware came with an installation CD or floppy disk, insert it now.
What do you want the wizard to do?
Install the software automatically (Recommended)
Install from a list or specific location (Advanced)
Click Next to continue.
< Back
Next >
Cancel

[Figure 3-2. “Hardware Wizard” window]

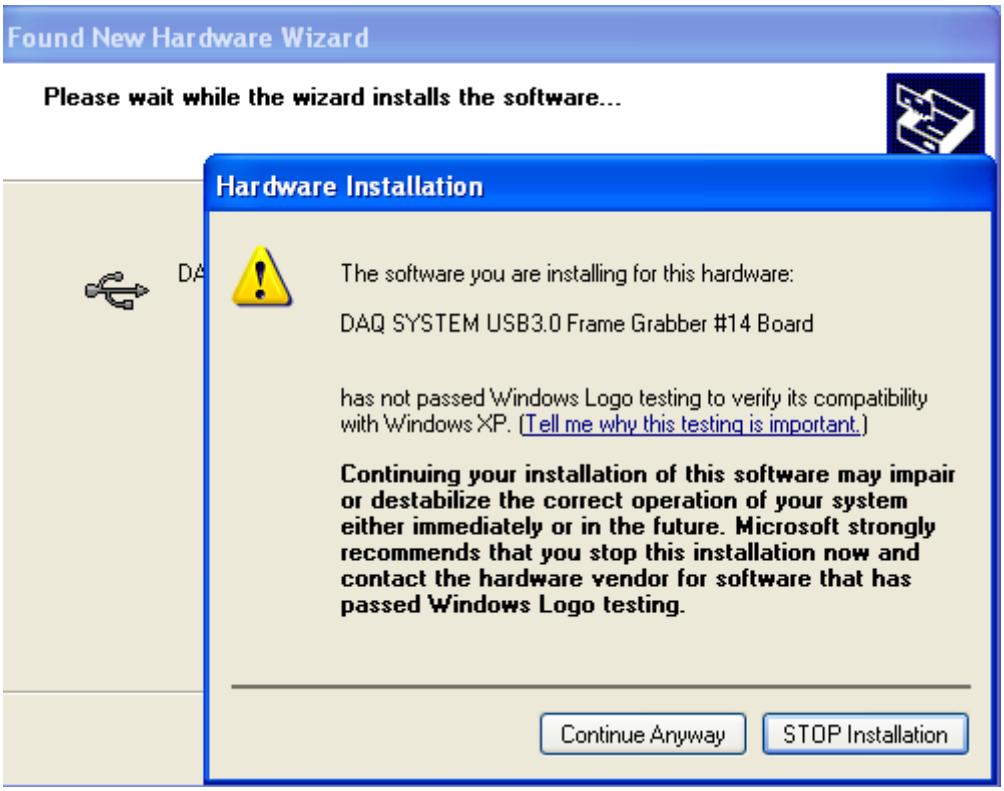
If new hardware is found, Wizard will ask you to install the corresponding driver, For installation of the driver, select item “Install from a list or specific location(Advanced)” and click “Next” as in the [Figure 4-3].


Found New Hardware Wizard
Please choose your search and installation options.
Search for the best driver in these locations.
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.
Search removable media (floppy, CD-ROM...)
Include this location in the search:
D:\DAQ_project\USB\CDROM_USB3_FRM14_201:
Browse
Don't search. I will choose the driver to install.
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.
< Back
Next >
Cancel

[Figure 3-3. Specify the driver folder]

Select “Search for the best driver in these locations”. Check “Search removable media (floppy, CD-ROM)”. Check “include this location in the search”. Click “Browse” button. Select the folder where the drivers are located. Click “OK”. Click “Next”.

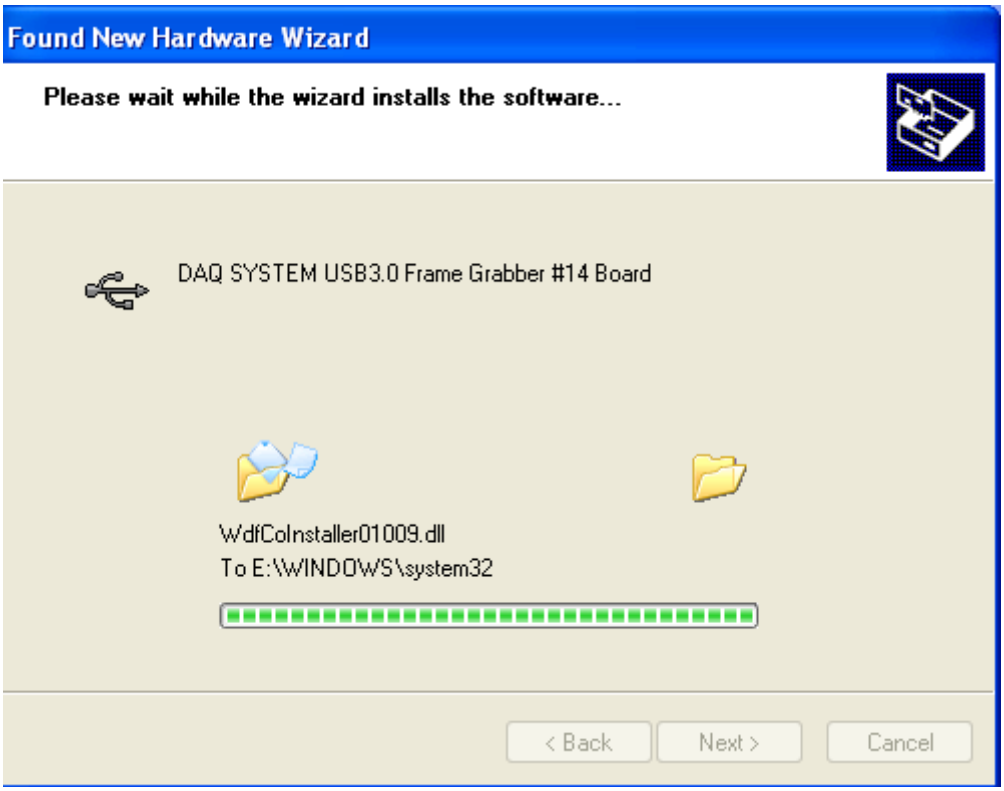
The necessary files are **“cyusb3.inf”** and **“cyusb3.sys”** in the driver polder.

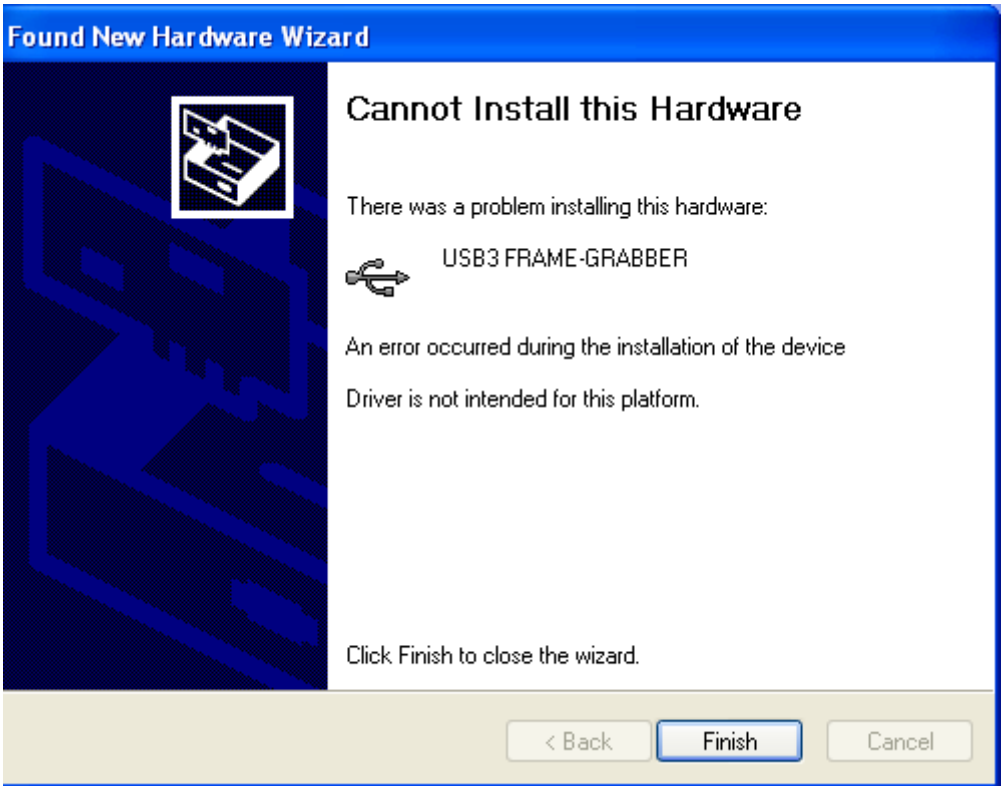

Found New Hardware Wizard
Please wait while the wizard installs the software...
Hardware Installation
The software you are installing for this hardware:
DAQ SYSTEM USB3.0 Frame Grabber #14 Board
has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation

[Figure 3-4. Warning window]

When you across a window's warning message regarding to the compatibility problem as shown the [Figure 3-4] during the installation process, just click "Continue" button and go on the installation.

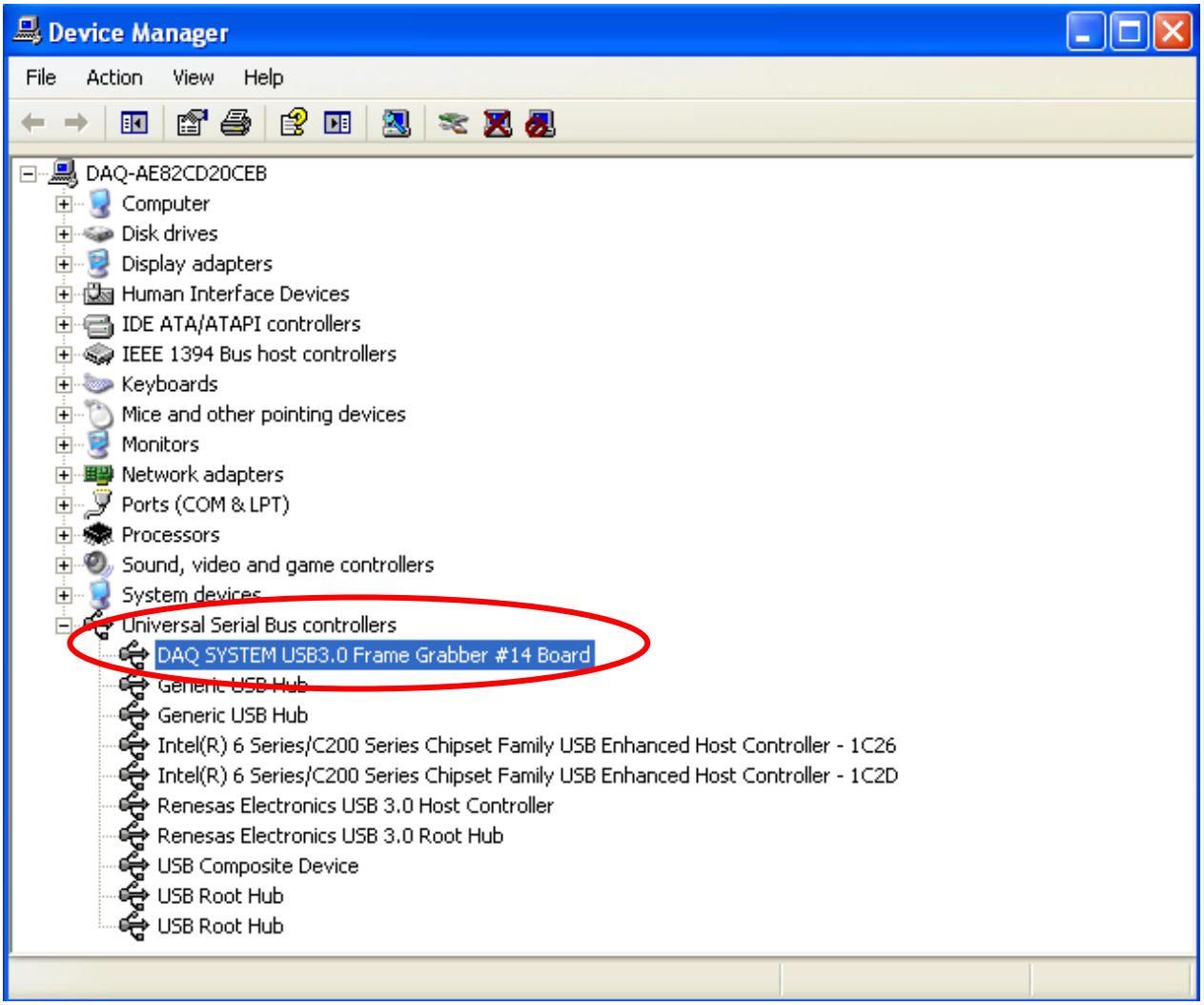
If the installation is completely finished, a completion window message shall be shown as in [Figure 3-5]. Click "Finish".




Found New Hardware Wizard
Cannot Install this Hardware
There was a problem installing this hardware:
USB3 FRAME-GRABBER
An error occurred during the installation of the device
Driver is not intended for this platform.
Click Finish to close the wizard.
< Back
Finish
Cancel

[Figure 3-5. “Completion” message window]

If you successfully complete the wizard, you can find the item **"DAQ system USB3.0 Frame Grabber #11 Board"** in the "Device Manager" window as shown in [Figure 3-6].



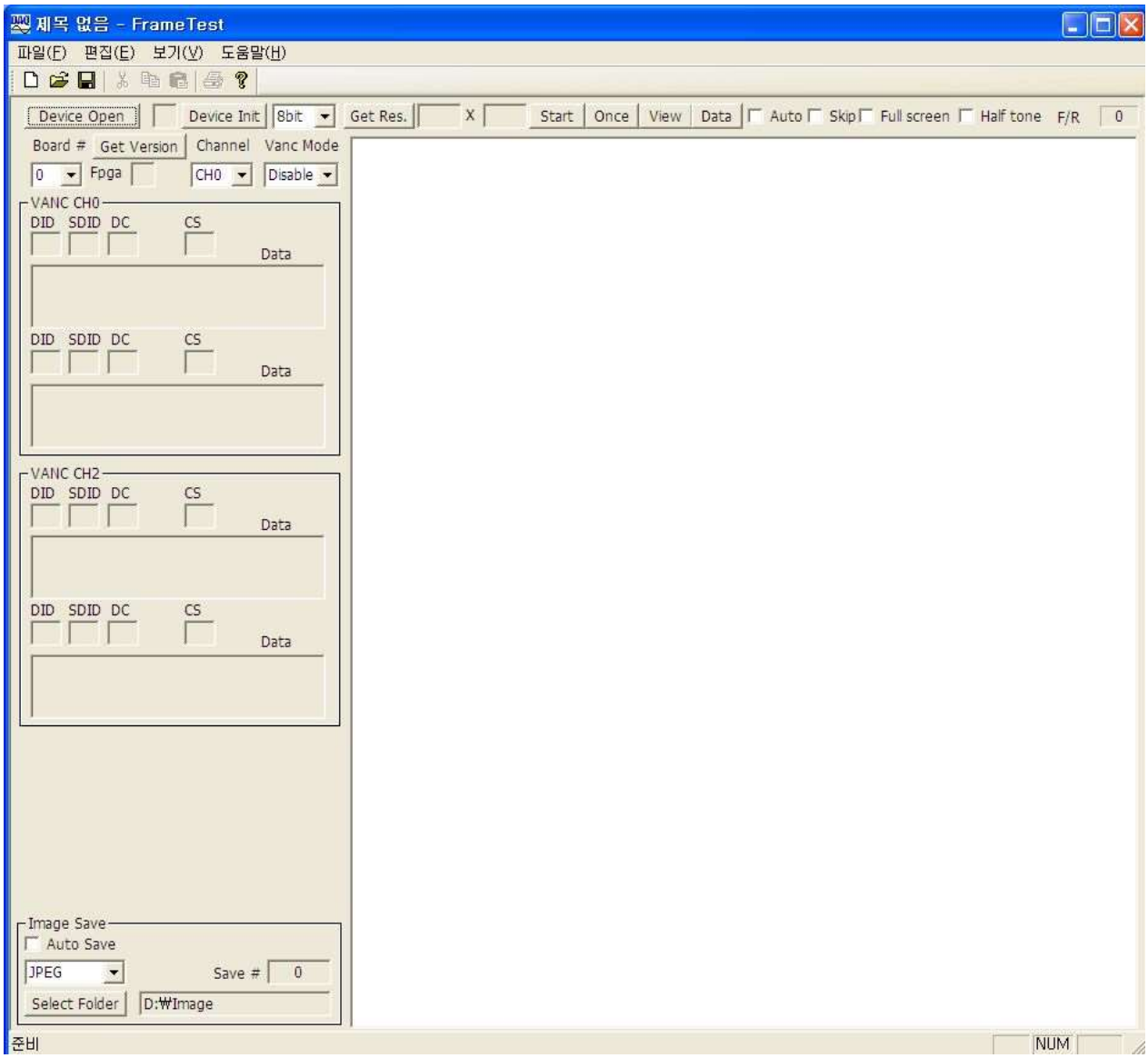
[Figure 3-6. "Device Manager" window]

If you can see the "DAQ system USB3.0 Frame Grabber #11 Board" at the Universal Serial Bus controllers, the driver installation is to have been over. (Check the red circle)

4. Sample Program

DAQ system provides a sample program to make the user be familiar with the board operation and to make the program development easier. You can find the sample program in the CDROM accompanying with the board.

Sample program is provided in source form in order to show the usage of API (Application Programming Interface) of the board and may be modified for customer's own usage.



[Figure 4-1. When Sample program "FrmTest.exe' is executed]

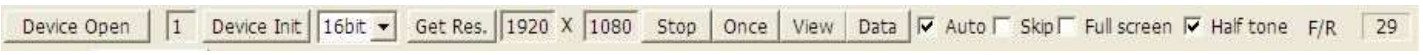
To run the sample application program, you need to use API (Application Programming Interface). It is a form of client DLL (Dynamic Link Library). You need the Import Library files and header files for compiling the sample source. You can find them in the CDROM. To run the execution file, the API

DLL file **(USB_FRM14.DLL)** must be located in the same directory with the execution file or Windows system folder. Another method is to add the directory of API DLL file to PATH environmental variable.

4.1 Image Processing

(Notice) The running order for the sample program as

Check the Board # ➔ "Device Open" click ➔ "Device Init" click ➔ Select Mode "8, 16, 24, 32" ➔ Select the Channel ➔ Vanc Mode "Disable" ➔Confirm "Get Res" ➔ "Start/Stop" Click ➔ "Auto" check



(1) **"Device Open" button**

It starts a selected board device.

(2) **"Device Init" button**

Press this button to initialize the function of receiving image frame data. It is performed only once after power is applied to the board.

(3) **"Mode" Selection**

It selects a Video Data Mode of 8bit, 16bit, 24bit, 32bit.

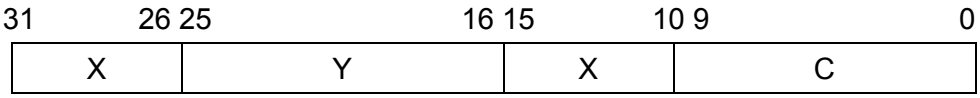
Depending on the selected data mode (8bit, 16bit, 24bit, 32bit), all data are stored in the buffer as shown below figure. 8-bit mode is not supported.

[Table 9. Data Structure]

Address	A0	A1	A2	A3	A4	A5	A6	A7
16bits per Pixel (m_nMode == 1)	C	Y	C	Y	C	Y	C	Y
24bits per Pixel (m_nMode == 2)	C	X	Y	X	C	X	Y	X
32bits per Pixel (m_nMode == 3)	C	X	Y	X	C	X	Y	X

cf) C : Chroma, Y : Luma, X : Don't care

Writing Method : Little Endian (In case of 10bit YUV)



One Frame Data size is as follow equation.

case 0 (8bit): nSize = nXres * nYres

case 1 (16bit): nSize = nXres * nYres * 2

case 2 (24bit): nSize = nXres * nYres * 4

case 3 (32bit): nSize = nXres * nYres * 4

cf) nXres : Horizonral Resolution, nYres : Vertical Resolution

(4) **"Get Res." button**

It shows the image resolution. If the "Vanc Mode" is set to "Y Vanc" or "C Vanc", the vertical resolution will be increased one. For example, if the original screen is 1920x1080, it is displayed as 1902x1081 after "Vanc Mode" is selected.

(5) **"Start" button**

It starts the image transfer. It is a Toggle button, press again stop the image transferring.

(6) **"Once" button**

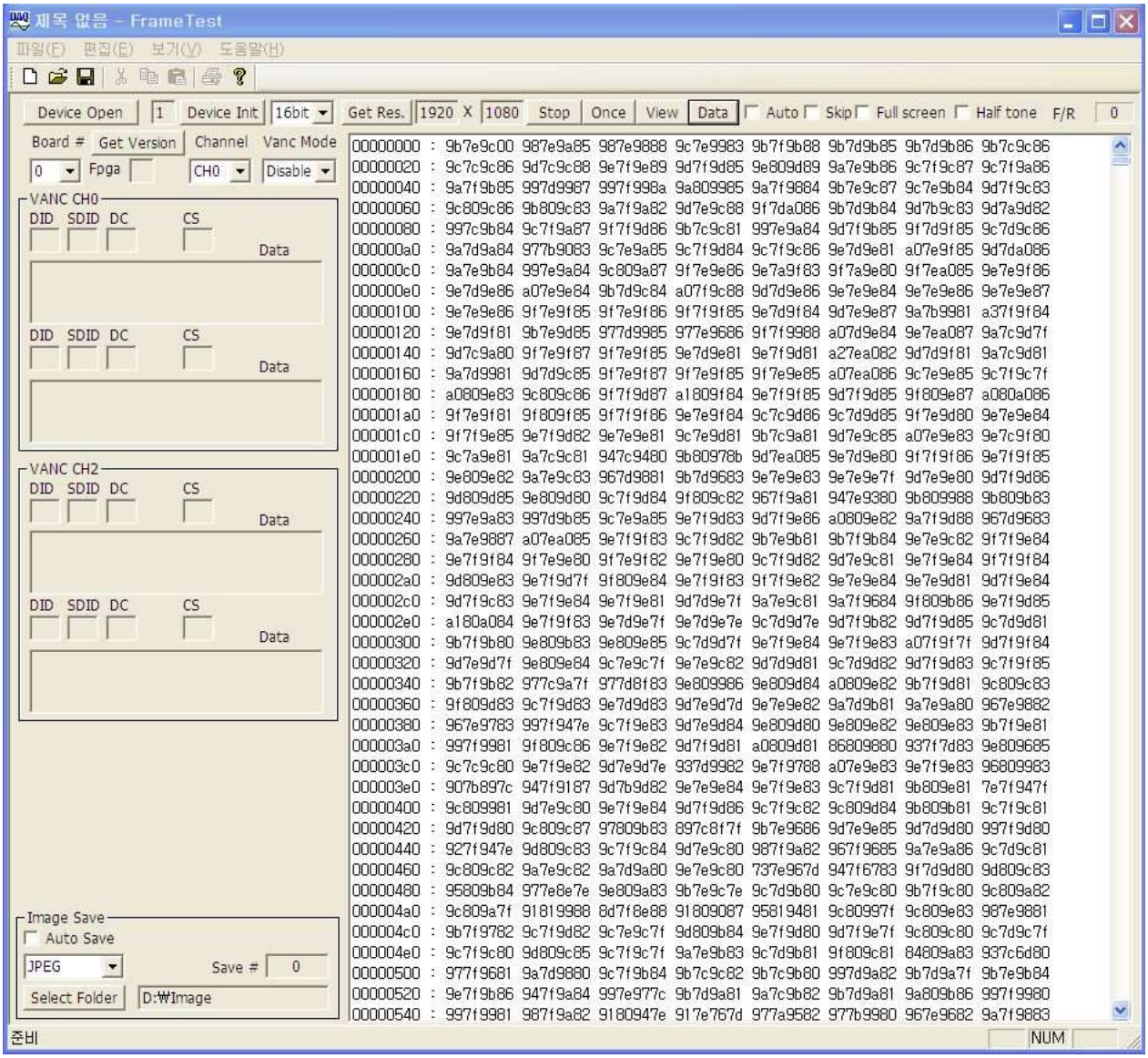
When press this button, it displays a freeze-frame.

(7) **"View" button**

Start the image transmission.

(8) **"Data" button**

Press this button to read the image frame data of the board to your PC(Hex Value). If image frame data is not saved on the board, you must wait until the end of data collection.



[Figure 4-2. Image File Hex Value]

(9) **"Auto" toggle**

When check this box, it displays a video

(10) **"Skip" toggle**

When press this button, it displays a freeze-frame.

(11) **"Full screen" toggle**

It shows full screen.

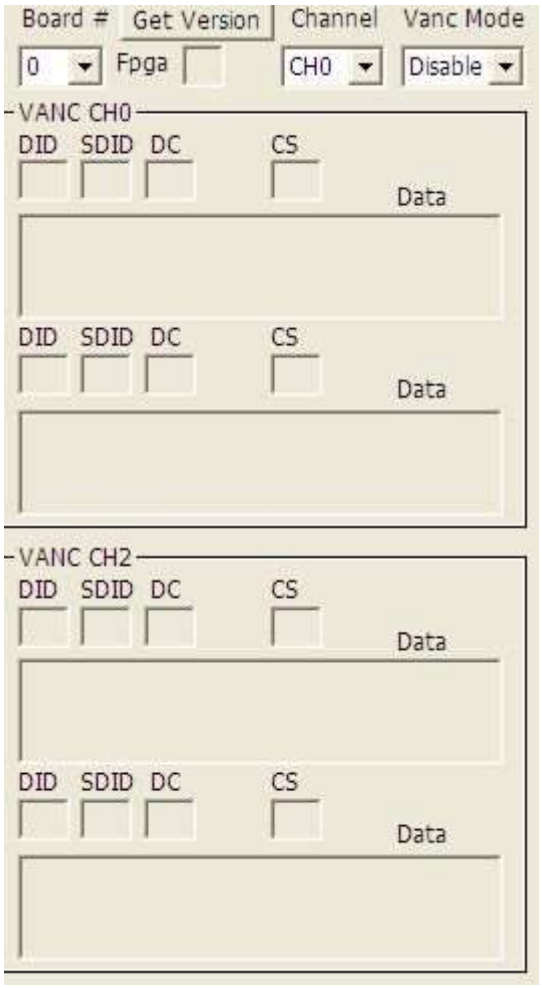
(12) **"Half tone" toggle**

Select the Half tone mode filter.

(13) **"F/R"**

Frame Rates/sec

4.2 ANC Data Processing



(Notice) Chapter 5 Test is more detailed description.

(1) **"Board #" Selection**

It selects a board number in case of the multi USB3.0 boards. It can select 0 ~ 4 at currently.

(2) **"Get Version" button**

It shows the version of FPGA and Firmware.

(3) **"Channel"**

Select the SDI channel.

CH0 : Use the channel connected to J8 Connector.

CH1 : Use the channel connected to J3 Connector.

Dual : Two channels can be used simultaneously.

(3) **"Vanc Mode"**

Select the VANC mode.

Disable : VANC mode of each channel is not used.

Y Vanc : The Vanc data is added to the Y packet of video of the configuration of the YCbCr.

C Vanc : The Vanc data is added to the C packet of video of the configuration of the YCbCr.

(4) **Vanc Data**

It shows the values of Vanc Data of the first and the second packet.

DID --- Data Identification

SDID --- Secondary Data Identification

DC --- Data Count

CS --- Check Sum

Data --- User Data

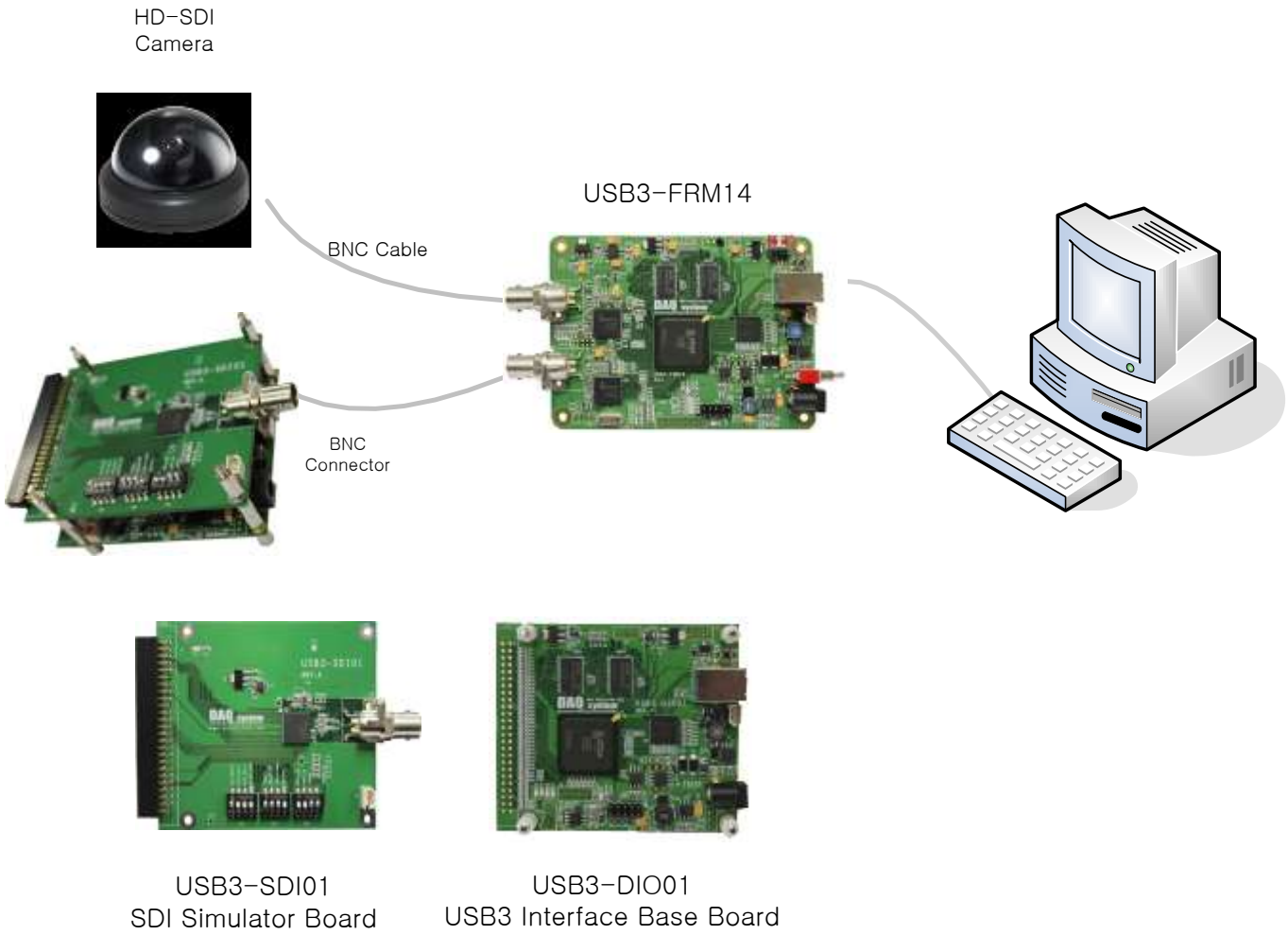
4.3 Image Saving

(1) **"Auto Save" toggle**

If the box clicks, image data is stored as a binary file below the specified **D:\Image** (or user-selected folder). The bottom of "Save Count" shows number of stored frames.

5. Test

For Vertical Ancillary (VANC) Data test, we are used with USB3-DIO01 and USB3-SDI01. USB3-DIO01 is USB3 interface Base Board with having the multi-function to process the data from/to the daughter board's signal. And, USB3-SDI01 is a simulator board for VANC data signal, it is changed SDI signal from the data of USB3-DIO01 and transmits the USB3-FRM14 board. Make sure that the VANC data is received correctly by connecting the USB3-DIO01 board USB3-SDI01 board as in [Figure 5-1]. HD-SDI camera is used the two cameras that support the 1080p (1920x1080 @ 30fps).



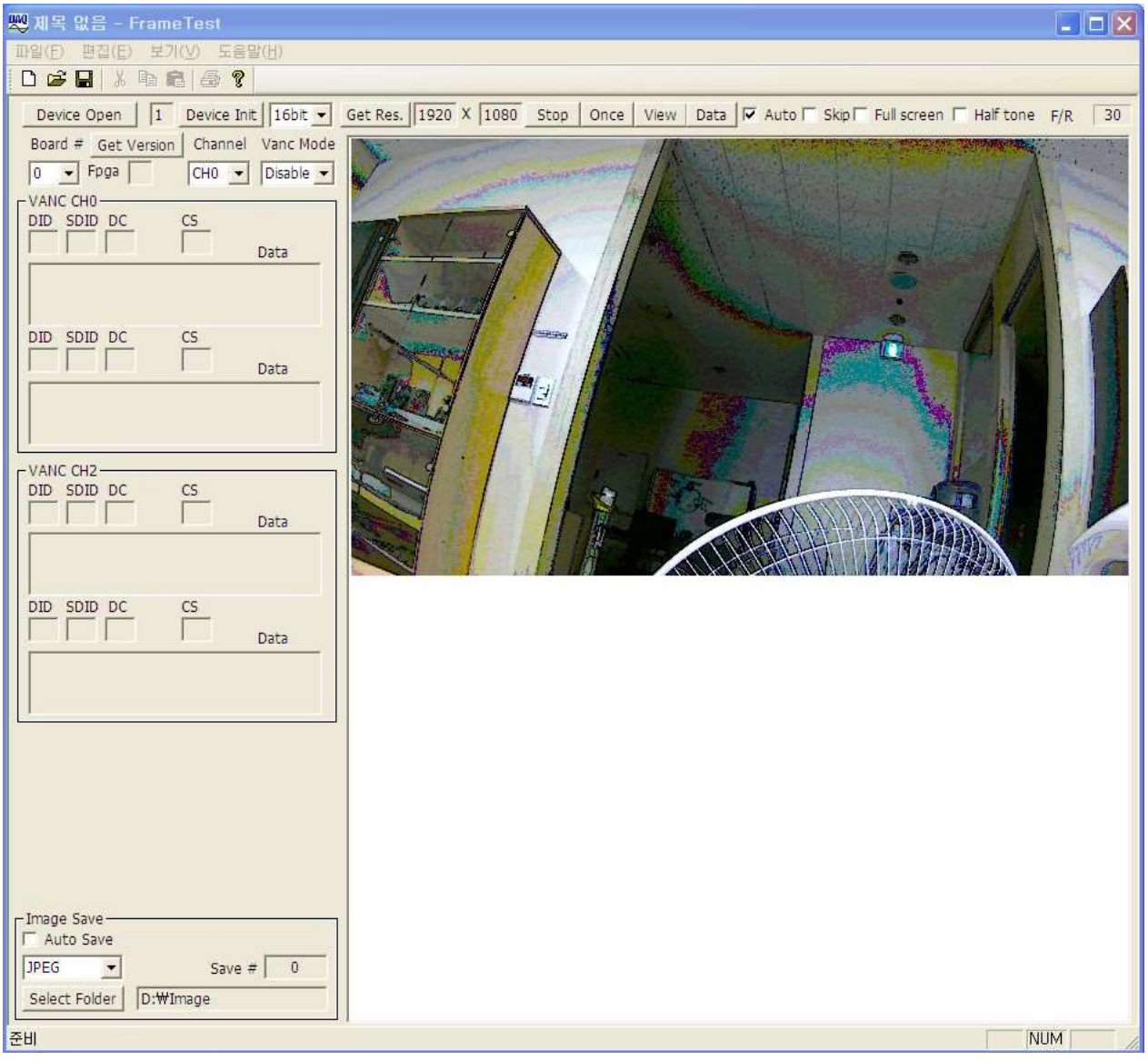
[Figure 5-1. Test Connection Structure]

5.1 Image Test

First, the Frame Test program is shown in [Figure 5-2] after connect the camera to the J8 connector of USB3-FRM14 board.

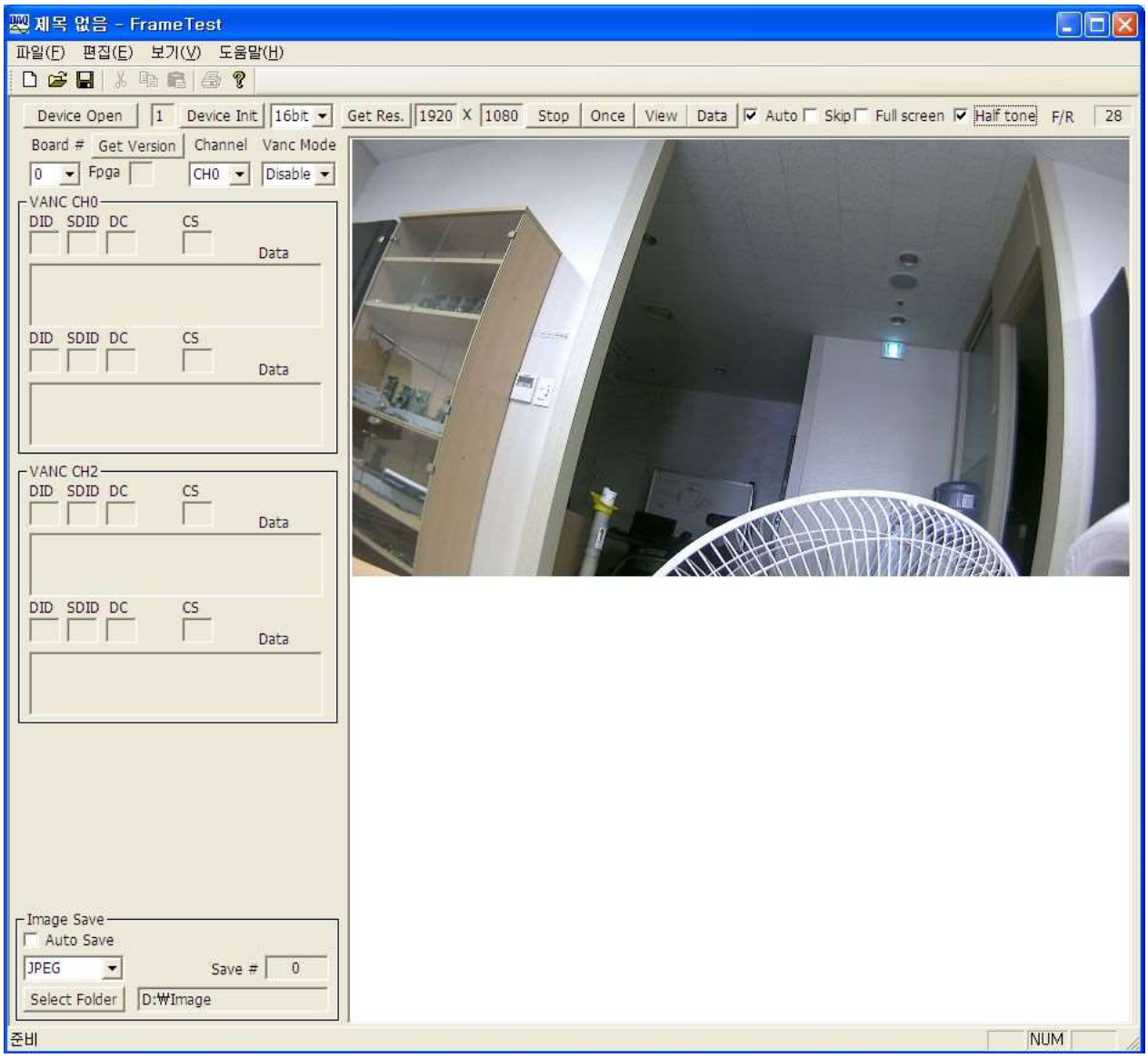
(Notice) The running order for the sample program as

Check the Board # ➔ "Device Open" click ➔ "Device Init" click ➔ Select Mode "8, 16, 24, 32" ➔ Select the Channel ➔ Vanc Mode "Disable" ➔Confirm "Get Res" ➔ "Start/Stop" Click ➔ "Auto" check



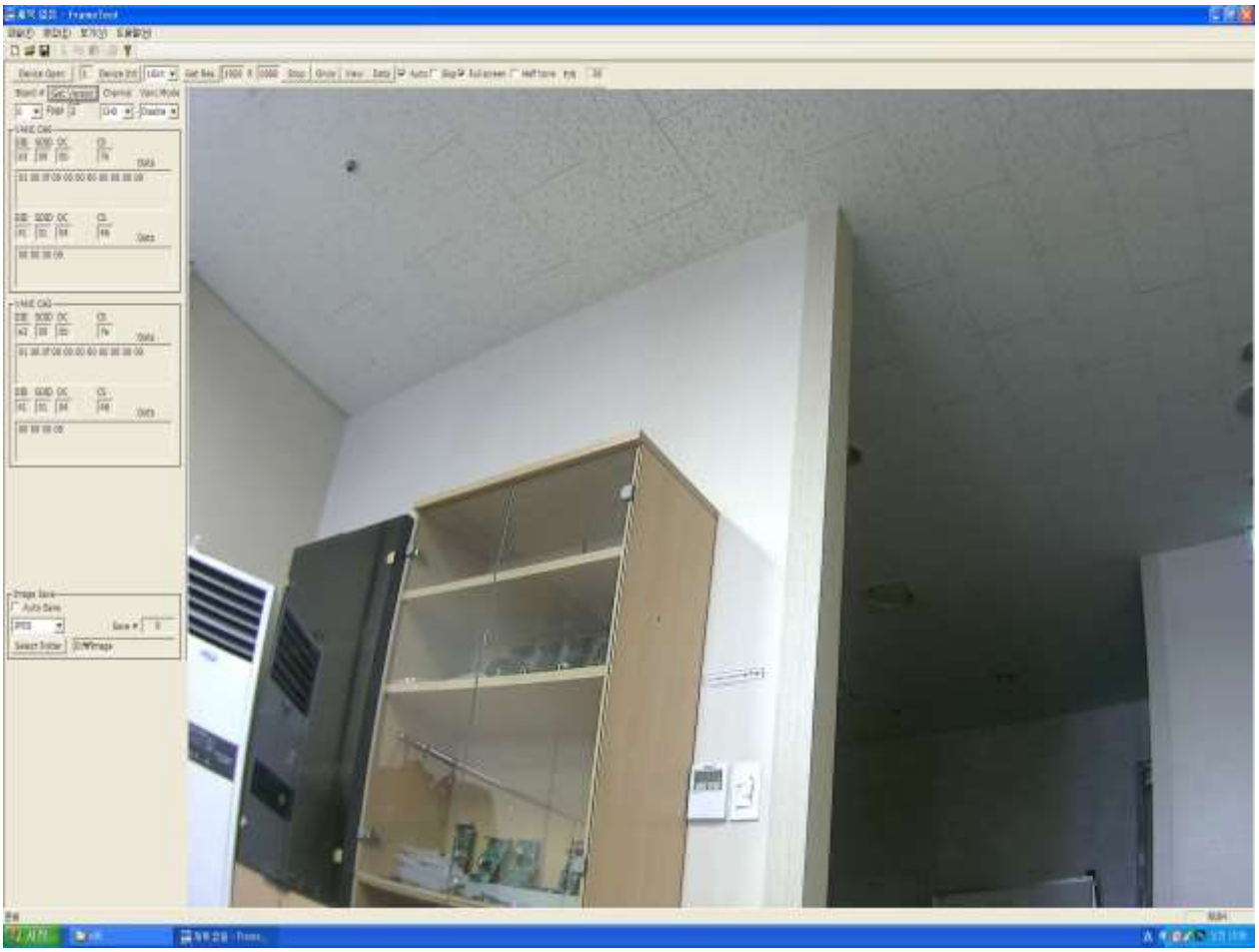
[Figure 5-2. "CH 0" Connection Display]

Under [Figure 5-3] is an example of the display when you select the "Half tone" for image improvement.



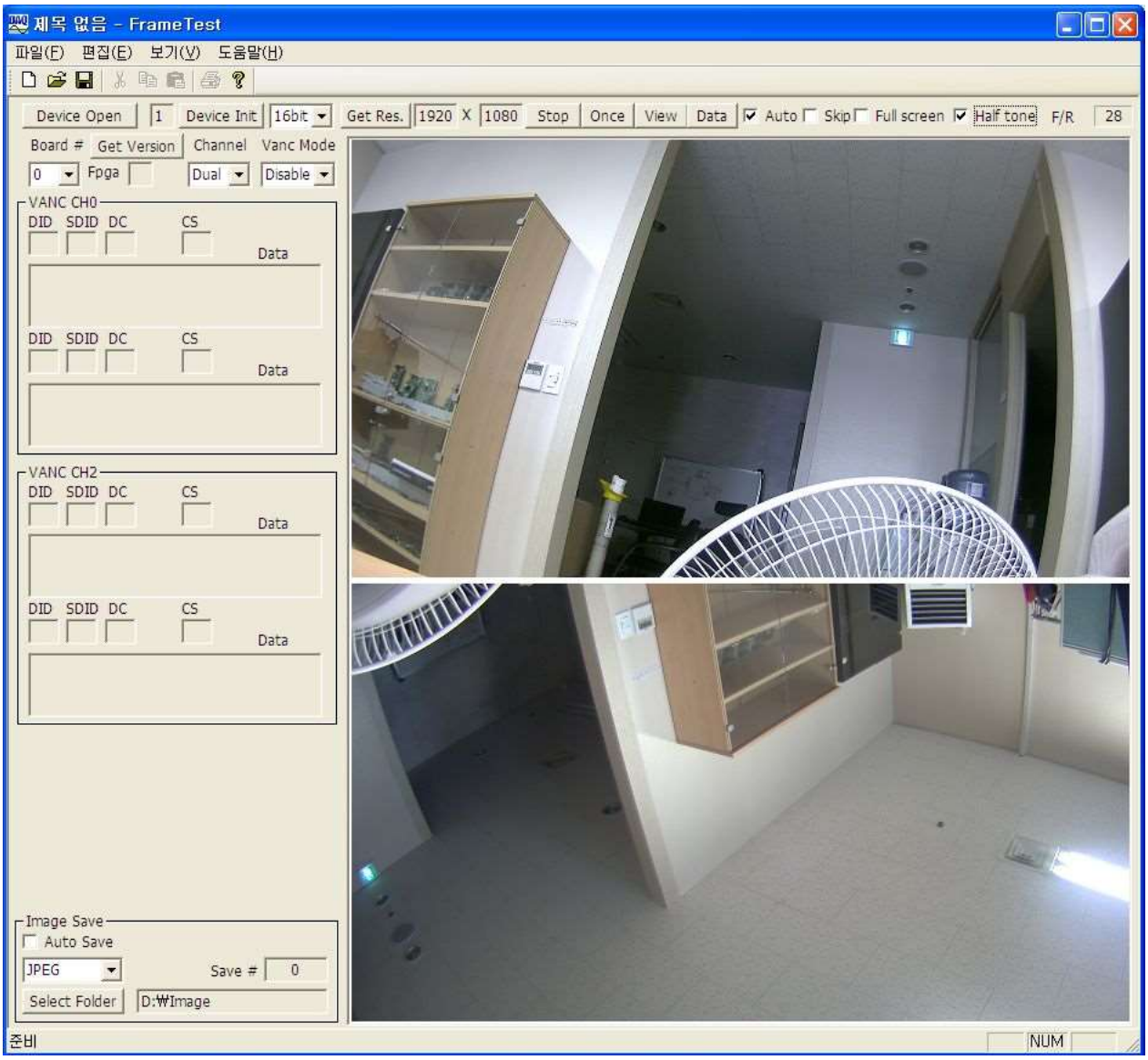
[Figure 5-3. “CH 0” Improvement Display]

[Figure 5-4] is the screen when you select the "Full Scree". Select the Full Screen, and a larger window, it is possible to see the resolution entire selected. Sometimes Frame Rate varies according to the system specifications.



[Figure 5-4. “CH 0” Full Screen Display]

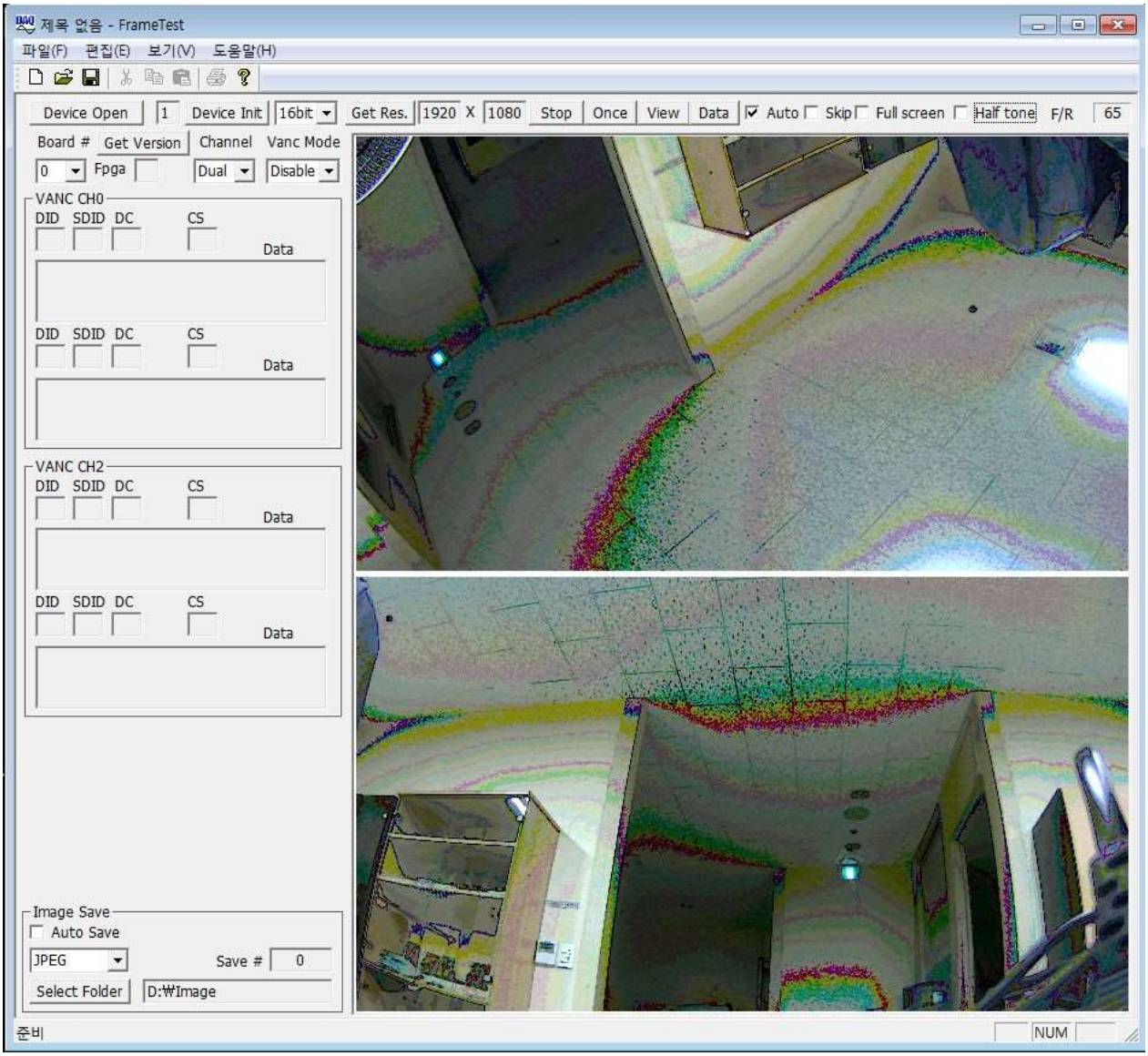
Under [Figure 5-5] is the screen when you have selected two channels simultaneously. Frame Rate according to the system requirements may change.



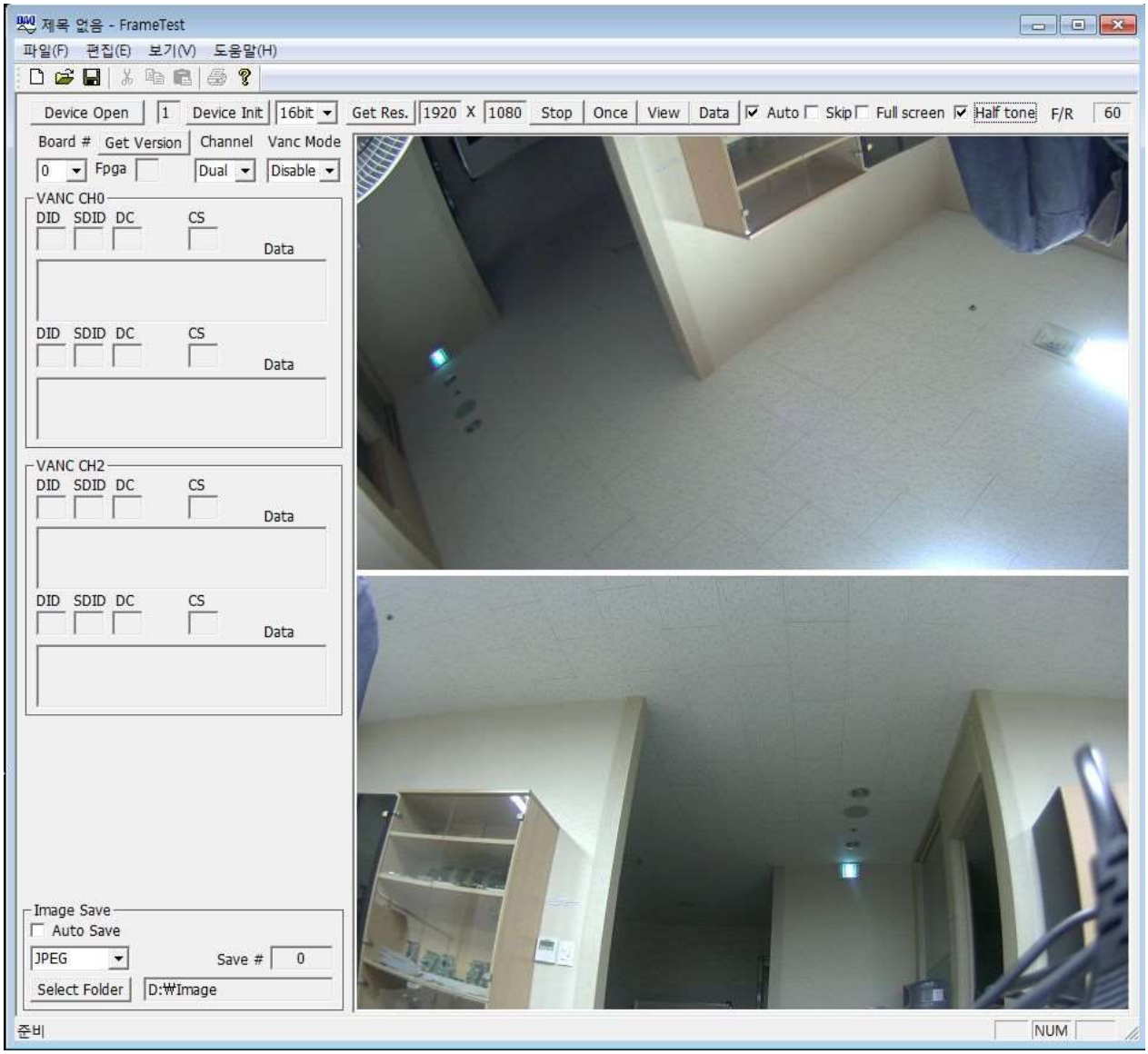
[Figure 5-5. When two channel select (Windows XP 32bit)]

(Notice) When sometimes the application program downs and there is only one video on the screen, we recommend that you use to connect the connector external power(12V DC) to J9 connector.

The [Figure 5-6] is the display when using the two channels on Windows 7 64bit O.S. F/R(Frame Rate) represents the 61 frame, it can be seen in each channel video from SDI two cameras for each 30 frames.



[Figure 5-6. When using the two channel (Windows 7 64-bit)]

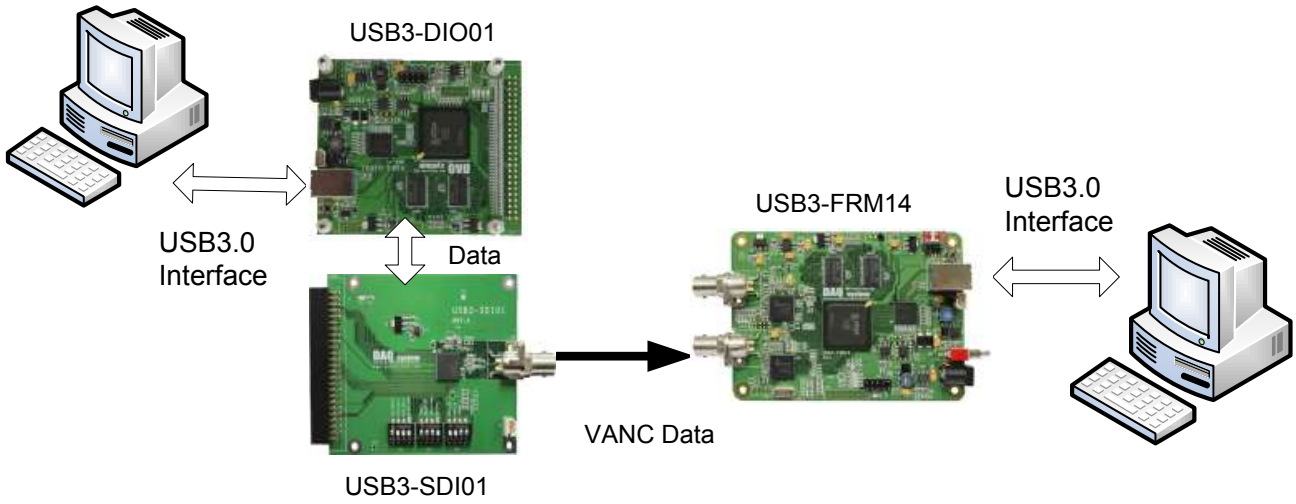


[Figure 5-7. When using the two channel (Windows 7 64-bit), Using half tone]

When comparing [Figure 5-5] and [Figure 5-7], the Frame Rate may change according to the system requirements. So, the test on Windows 7 is better testing on Windows XP. And, 64bit O.S is better than 32-bit O.S.

5.2 VANC Test

The board connection for VANC implementing is as [Figure 5-8].

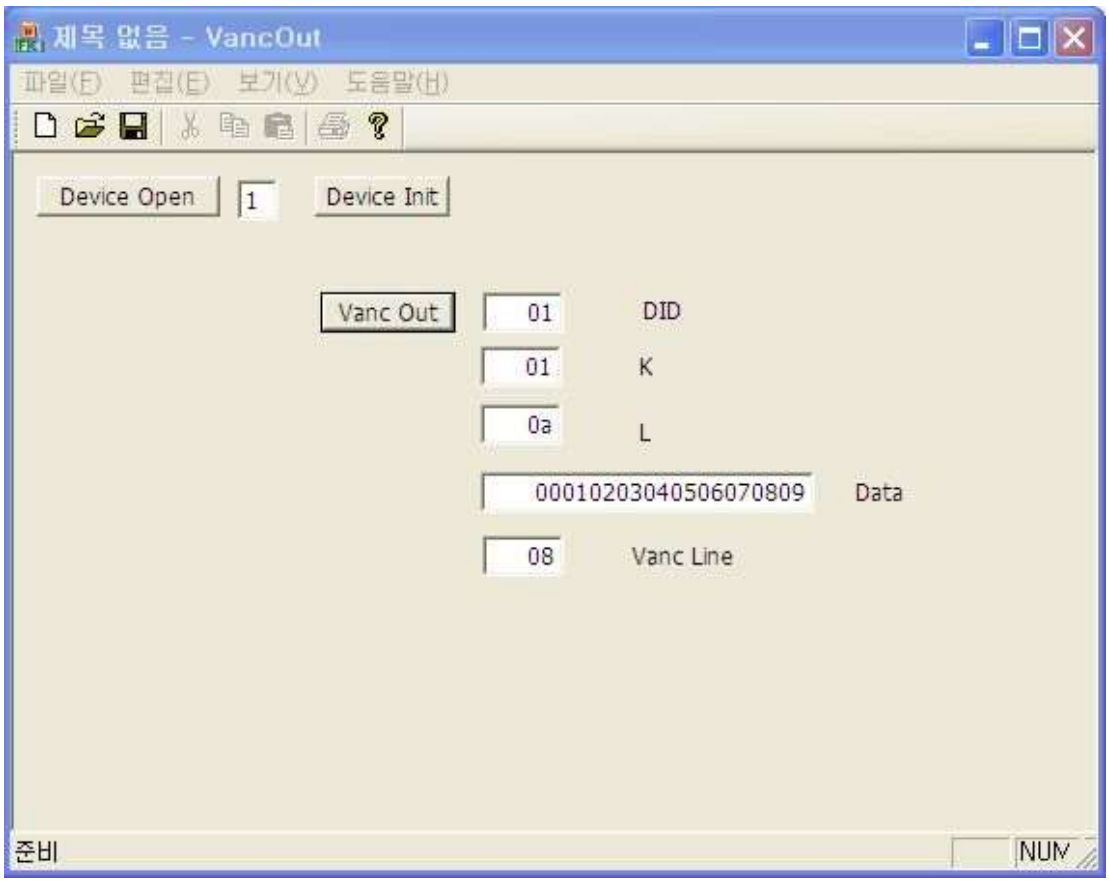


Board Connection

[Figure 5-8. Board Connection]

First, an application program of USB3-DIO01 when used is as [Figure 5-9].

The application operates in USB3-DIO01. VANC data sends to the output connector of USB3-SDI01Simulator.



[Figure 5-9. VANC Data Transmit Program]

That command description is as follows.

Device Open --- Open the device. It is performed only once in the beginning.

Device Init --- Current device that attached to the system is initialized.

Vanc Out --- Under the set value is sent in USN3-SDI01 BNC connector.

DID --- Data Identification

K --- Secondary Data Identification

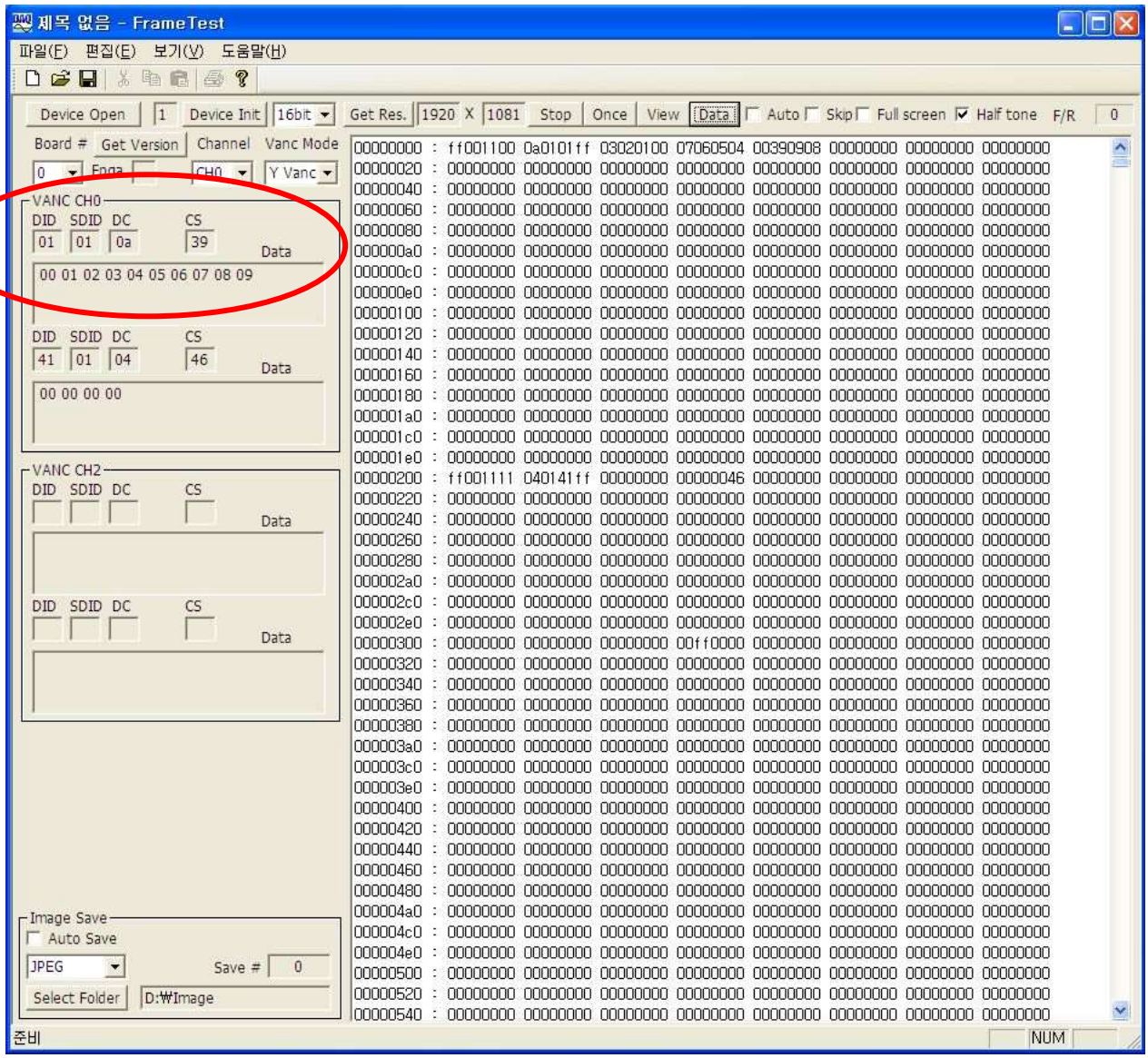
L --- Data Counter, the number of User Data bytes. It is displayed in Hex.

Data --- User Data. This program has a limitation for testing purpose, but originally user data supports total 255bytes.

Vanc Line --- You specify what number Vertical line to write ANC data, that is, you specify what number Vertical Line VANC data starts.

(Notice) This program transmits the first ANC packet information.

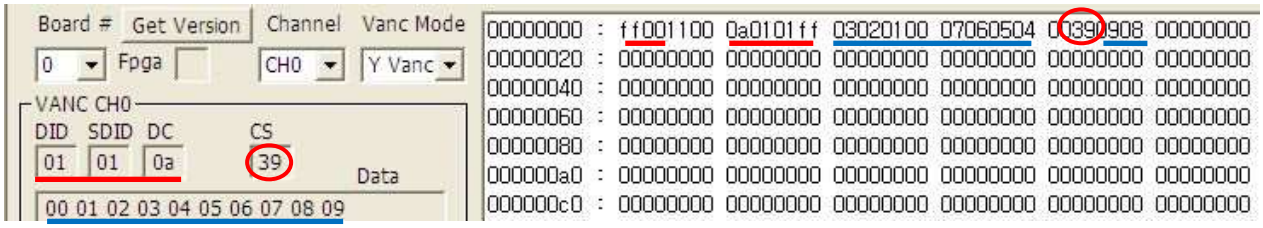
[Figure 5-10] is a screen of Frame Test program, shows that VANC data is received on channel 0 of USB3-FRM14. You can see that the values of VANC CH0 data on the top left column (Check the inside red circle) when “Vanc Out” press in [Figure 5-9].



[Figure 5-10. USB3-FRM14 Frame Test]

The first and second VANC data is only displayed in [Figure 5-10]. If necessary, user can be used 4 VANC data packet by user defined. ANC data packet is 512 bytes including the part of Header and other packet information and user data's (UDW) 255bytes. The second VNC packet starts address 200h in [Figure 5-10], this means the packet size is 512bytes.

More explain concretely, Vertical Ancillary Data starts at the beginning of the "00" "ff" "ff". "01" "01" "0a" of DID SDID DC value shows the red line of the right side, and the last value CS of VANC can be seen in the red circle. In addition, the data values are same (see the blue line).



(Notice) 1. Interlace mode does not currently support.

2. BNC Channel 0(J8 connector) has a priority, must be always used in connection from the beginning.

3. Each channel can not connect to the other resolution. The resolution of channel 1, it must be the same as the resolution of channel 0.

➔ Future upgrade or modification is planned.

Appendix

A.1 Specification

USB3.0 Interface

- USB 3.0 Interface
- Super Speed Device 5Gbps

Physical Characteristics

- Camera Interface : Dual HD-SDI
- Dimension : 109 x 79.5 mm

Power Requirement

- Voltage : +3.3V (Max. 500mA)
  +12V (Max. 1A)

Environment

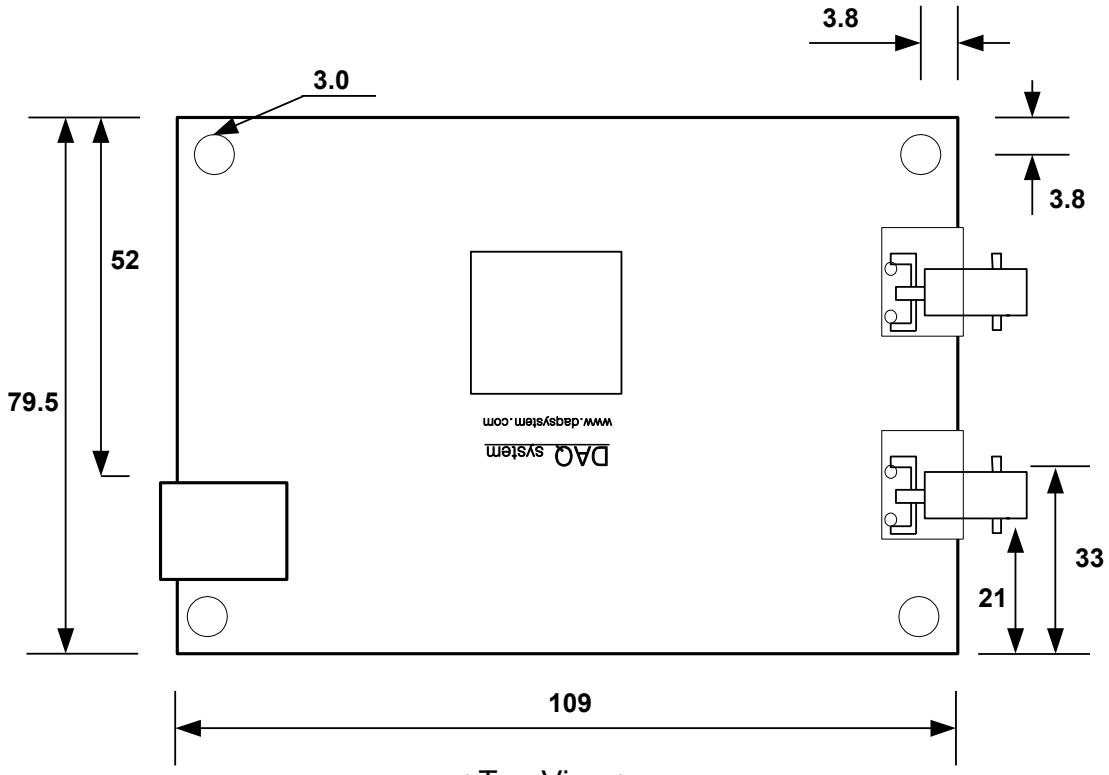
Caution) When using Internal

- Operating Temperature : 0 ℃ ~ 60 ℃
- Storage Temperature : -20 ℃ ~ 70 ℃
- Relative Humidity : 5% ~ 90%, non-condensing

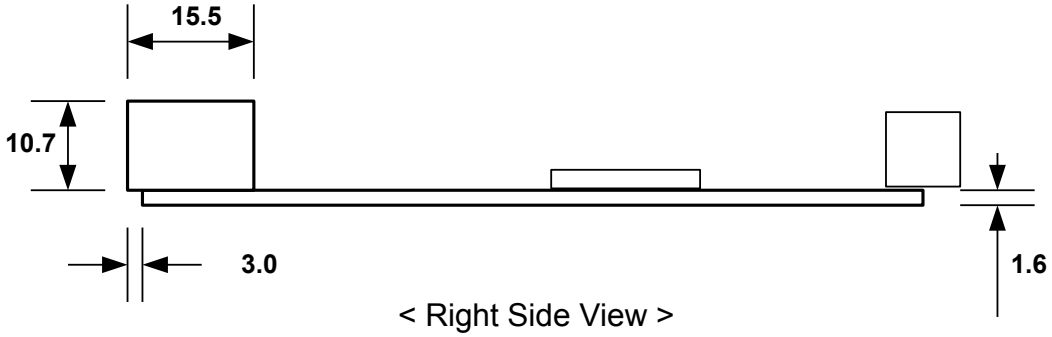
Software

- OS : Windows XP SP1 / Windows 7 XP1
- API : Interface with Application through client DLL
- Sample Software : Test Sample software for evaluation

A.2 Physical Dimension



< Top View >



< Right Side View >

References

1. USB 3.0 System Architecture

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2. Universal Serial Bus Specification

-- Compaq/Intel/Microsoft/NEC, MindShare Inc. (Addison Wesley)

3. AN201 How to build application using API

-- DAQ system

4. AN342 USB3-FRM14 API ver1.0

-- DAQ system